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Decision tree

Preventing the occurrence of empty nose syndrome

Chronic nasal obstruction

• Nasal endoscopy •
CT scan (if needed)

Search for the origin of the chronic nasal obstruction
according to: – the characteristics of the obstruction – the findings of the clinical examination – possibly the clinical test with local vasoconstrictors in the absence of contraindications

Inflammatory, tumoral, pseudo-tumoral or infectious cause

Management adapted to the etiology

Architectural origin

Septoplasty or rhino-septoplasty
-> No lower turbinal gesture associated in 1st intention

Mucosal origin

Mixed origin

Research of the etiology, in particular allergic with the appropriate means (diagnosis of rhinitis, diagnosis of allergy)

Medical care adapted to the etiology

Efficacy evaluation after at least 3 months

Symptomatic failure of medical management

Verification of compliance

New clinical examination

Suspicion of a remarkable discrepancy between the intensity of the obstruction felt by the patient and the clinical examination

YES

CT scan and instrumental nasal exploration (rhinomanometry and/or acoustic rhinometry) with vasoconstrictor provocation tests (in the absence of contraindications) if they have not been performed beforehand

Discrepancy confirmed

Discrepancy not confirmed

A turbinal reduction gesture can be proposed, favoring the techniques with the least risk of occurrence of a VNS, preserving at least 2/3 of the turbinal structure

NO

Symptomatic failure of the turbinal gesture

New clinical assessment including: – imaging – instrumental tests (rhinomanometry and/or rhinometry) with vasoconstrictor provocation tests (in the absence of contraindication) before any decision for more invasive turbinal surgery

Existence of a remarkable discrepancy between the intensity of the obstruction felt by the patient and the results of the assessment, in particular of the instrumental tests

Ask for a psychiatric opinion to look for a possible functional somatic disorder before any (new) surgical decision

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Analysis presented by question

Analysis carried out on all validated questionnaires.

Project: Prevention, diagnosis and management of empty nose syndrome
Questionnaire: Prevention, diagnosis and management of empty nose syndrome

Expert	Validation date
Specialist 1	08/26/2022
Specialist 2	07/12/2022
Expert 3	07/28/2022
Expert 4	09/08/2022
Expert 5	08/26/2022
Expert 6	08/25/2022
Expert 7	08/12/2022
Expert 8	07/21/2022
Expert 9	07/14/2022
Expert 10	08/21/2022
Expert 11	07/09/2022
Expert 12	08/20/2022
Expert 13	08/07/2022
Expert 14	08/25/2022
Expert 15	07/21/2022
Expert 16	07/24/2022
Expert 17	07/23/2022
Expert 18	07/24/2022
Expert 19	07/13/2022
Expert 20	08/19/2022
Expert 21	07/21/2022
Expert 22	05/09/2022
Expert 23	01/09/2022
Expert 24	07/10/2022
Expert 25	07/29/2022
Expert 26	08/17/2022
Expert 27	07/26/2022
Expert 28	07/27/2022
Expert 29	07/25/2022
Expert 30	09/08/2022
Expert 31	07/21/2022

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Expert 32	07/24/2022
Expert 33	07/24/2022
Expert 34	07/28/2022
Expert 35	08/24/2022
Expert 36	07/26/2022
Expert 37	07/15/2022

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Thank you for agreeing to participate in the Reading Group on the good practice guideline with the theme "Prevention, diagnosis and management of empty nose syndrome".
Your mission consists of: reading the text of the recommendations and the arguments, giving an opinion on the quality of the arguments by free comments, and if necessary by specifying the data from the literature which have not been taken into account (in this case, please send the references or articles that should be taken into account), to give an opinion on the readability, feasibility and applicability of the recommendations by rating each proposal for recommendations using the rating scale and providing complementary or contradictory arguments (in the form of free comments) based if possible on the literature, and on your expertise when the literature is insufficient or non-existent.

We invite you to read the text of the argument and the text of the recommendations before completing the questionnaire, in order to have an overall view.
Likewise, we invite you to answer by respecting the order of the questionnaire (vertical reading of the questionnaire) because of the existing interrelation between the different proposals of the chapters.
For the rating phase, next to each proposal of the questionnaire is placed a discontinuous numerical scale graduated from "1" to "9".

The rating must be based on data from the literature and your experience in the area addressed.
The value "1" means that the proposal is not at all consistent with current literature data and you totally disagree with the proposal, the value "9" means that the proposal is fully consistent with current data of the literature and that you totally agree with the proposition, the values between "2" and "8" translate the possible intermediate situations, the value "5" corresponds to your indecision.

It is important to avoid missing data: if you are undecided, it is better to rate "5" rather than not answering.

You also have the possibility of indicating that the question is outside your field of competence ("I cannot answer").

We draw your attention to the fact that only the final versions of the documents will be distributed.
These may be modified from those we send you.
Therefore, we thank you for respecting confidentiality and not distributing these documents.
The deadline for responding to this questionnaire is July 29, 2022.
We thank you for your collaboration in this project and remain at your disposal for any additional information or technical questions.

Cedric Paindavoine

Good Professional Practices Department
High Authority of Health

Your contacts :

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Text of the recommendations: Prevention, diagnosis and management of empty nose syndrome

Preamble

Proposal 1

Do you have any comments regarding the preamble?

Missing values: 1

Quote value	Wording
1	Yes
2	No

Distribution of responses by number rating

Rating scale	1	2
Number of responses	9	27

Expert	Comments
Specialist 2	Agree on the lack of reliable studies. Prevention, diagnosis, management of SNV: 3 key elements to avoid : - the SNV - allow victims of SNV not to fall into medical wandering by saving time in setting up appropriate treatment.
Expert 5	It is mentioned in the preamble that the SNV has only been known for 15 or 20 years whereas turbinal surgery is much older. However, it is also mentioned that KERN used this term as early as 1994, ie almost 30 years ago. Also, while the term SNV has been around since 1994, its symptoms have been known for at least 70 years. I have a photocopy of the ENT encyclopedia THOMSON & NEGUS from 1955 which describes almost all the symptoms of NSV: Crusts, hyperventilation, paradoxical obstruction etc. following total turbinectomy and which recommends not removing all of the inferior turbinates. This work is taken up in footnote n°42 of the attached article.
Expert 14	"There is a lack of knowledge and recognition on the subject, and the impact on

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	the quality of life of the patients concerned is major, but advances exist (study on dyspnea invoking hyperventilation, work on the flow of fluids by a team from Marseille, etc.). emphasis should be placed on informing the patient." propose of "Despite the lack of knowledge on the etiology, the physiopathology I SNV, patient information is a priority because of the major impact on quality of life."
Expert 21	No text in preamble section
Expert 24	In the preamble, the question is asked: "Could a simple cauterization of the inferior turbinates (the least invasive gesture possible) cause VS in certain patients?" From the outset, the answer is yes since patients have a medical diagnosis mentioning "empty nose syndrome" while they have only undergone "simple cauterization of the inferior turbinates". So it is not the conditional that must be used nor the interrogative form, it is indeed the present and the affirmative, which gives us: a simple cauterization (...) can indeed cause an snv in some patients. It would therefore be necessary to reformulate the proposition in the preamble, which would give us: "why a simple cauterization of the inferior turbinates (the least invasive gesture possible) can cause NSV in certain patients?" Moreover, it is written: "In any case, the emphasis must be on informing the patient". I ask the question here: does each patient who is going to have surgery on their turbinates (turbinectomy, laser, etc...), including on an outpatient basis, currently receive an information sheet on the risk of complications and therefore potentially of developing the snv, as weak as it is? The answer is clearly no. We should already start by informing the patient with an explanatory sheet so that he can then make his decision in full knowledge of the facts because otherwise this is called a lack of information!
Expert 25	The text would gain in readability by using short sentences. Enumerations can get me lost. For example, for the objectives, it is first of all a question of a general goal, then afterwards of a finality which is broken down into at least 4 orientations: 1 to improve the care of patients (moreover the care responsibility of the NVS rather than the person) 2 improve the quality and safety of care (quality includes safety, it seems to me) 3 help in the decision-making of professionals 4 allow the professionals concerned... It's too or not explicit enough with action verbs Moreover for the "Targets": specify from the outset that there are two of them, the patients and the professionals, and thus make a single paragraph. “Representatives of patient and user associations should also be associated” with what, exactly?

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	Is it a potential, necessary "target"? To be specified, in my opinion.
Expert 26	In the "Background" section: - First sentence: I would have rather specified: turbinal reduction carried out as a remedy in the event of failure of medical treatments for nasal obstruction of non-tumor origin (allergic rhinitis, non-allergic rhinitis, etc.) - second sentence: I would not have no minimum delay indicated but I would simply have specified that the delay in occurrence is very variable, possibly several years after turbine reduction - third sentence: I would have put rather that the incidence cannot be reliably estimated - second paragraph, I would have replaced "neuropsychic factors" by variable neuropsychic repercussions. the loss of the functions of humidification, of heating of the inspired air and of the sensory receptors are more suspected than scientifically proven, and very few articles
Expert 27	mention it. The number of sensory receptors has never been measured it seems to me, but rather menthol sensitivity. can be nuanced by saying: probably a decrease in the heating of the inspired air and the feeling of freshness on inspiration. for humidity, there is only one numerical study (balakin) suspecting it and another not finding any drop in humidity (tsakiropoulo), maybe nothing put
Expert 30	The introduction highlights the problem well.
Expert 32	I would change this sentence: "Empty nose syndrome (VSS) is a complication of turbinate reduction surgery performed as a last resort in cases of nasal obstruction, allergic rhinitis, etc." by: "Empty nose syndrome (VSS) is a complication of turbinate reduction surgery performed to treat chronic nasal obstruction after failure of non-surgical treatments." I wouldn't call it allergic rhinitis because it's a diagnosis and not a symptom.
Expert 36	In the extra-nasal signs mouth , insist on ventilation disorders including breathing is preferred with poor labial closure, a low position of the tongue at rest, in other words disorders of the oro-facial sphere (oro-myo-facial disorders).

1. General

1.1. Definition

There is no consensus definition of SNV. Nevertheless, it should be identified and for this the group

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work proposes the following definition.

Proposition 2

The NSV is characterized by the occurrence of a procession of nasal symptoms, associated with extranasal repercussions, occurring more or less shortly after a gesture of reduction of the inferior turbinates carried out in isolation or associated with other gestures on the structures nasosinuses (nasal septum, middle turbinates, sinuses, nasal pyramid). (EA)

Missing values: 0

Minimum value: 1

Maximum value: 9

Median: 8

Average: 6.90

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	1	4	0	6	0	1	1	7	17	0

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4 Zone	5 to 9	
Number of responses in % 29.73		70.27

Expert	Comments
Specialist 2	Not only after a gesture on the lower turbinates. SNV with gesture on the middle turbinates alone. 41. Saafan ME. A cellular dermal (alloderm) grafts versus silastic sheets implants for management of empty nose syndrome. Eur Arch Otorhinolaryngol 2013;270(2):527-33. http://dx.doi.org/10.1007/s00405-012-1955-
Expert 5	Even if I am not concerned, it seems from conversations with other patients that the removal of the middle turbinates alone led to the SNV. This is also what the HAS recognizes in the SNV scientific argumentation document, even if the SNV only appears more rarely in the event of turbinate removal. My proposal is to add removal of the middle turbinate(s) alone as a cause of NSV. Finally, this definition does not include the term "disturbed natural respiration", which is a shortcoming in my opinion. As far as I am concerned, the absence of my inferior turbinates prevents me from breathing through my nose while the passage

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	is open. Even in sleep, I wake up at night because exclusively oral breathing dries out my mouth and I have to drink to moisturize my oral mucous membranes. add "bilateral and more than
Expert 7	50%" after "cone reduction gesture lower"
Expert 8	"...after a gesture of reduction of the inferior turbinates..." The literature also lists cases of SNV occurring after procedures performed on the middle turbinates. It would be preferable not to limit the scope to the inferior turbinates alone.
Expert 9	the term more or less short term in the definition is too imprecise. The text of the recommendation specifies a probable quantified duration of less than 2 years, which should appear in the definition. cases of SNV exist
Expert 11	after interventions on the middle turbinates 7. Chabra N, Houser SM the diagnosis and management of empty nose syndrome. Otolaryngol Clin N Am 2009;42(2):311-30,ix.
Expert 12	houser recognizes the snv on the medium turbinates (argumentary reference 7-9)
Expert 16	Houser proposed a classification of SNV into four groups based on tissue resection. ENS-IT patients are those who have undergone partial or total amputation of the inferior turbinates. ENS-MT patients are those who have undergone partial or total amputation of the middle turbinates. In ENS-Both patients, the inferior and middle turbinates were completely or partially resected. The SNV due to an act on the middle turbinates exists, a sentence on the middle turbinates is missing. 7. Chhabra N, Houser SM. The diagnosis and management of empty nose syndrome. Otolaryngol Clin N Am 2009;42(2):311-30, ix. http://dx.doi.org/10.1016/j.otc.2009.02.001 9. Houser SM. Empty nose syndrome associated with middle turbinate resection. Otolaryngol Head Neck Surg 2006;135(6):972-3. http://dx.doi.org/10.1016/j.otohns.2005.04.017
Expert 19	SNV on lower and or middle turbinates (7-9) Houser
Expert 24	Indeed, the snv can occur very quickly after the surgical procedure on the turbinates, as it can occur months or even years later. What makes this pathology totally unpredictable. However, the proposal should be reformulated because the middle turbinates are only slightly taken into account in this one, whereas there are cases of snv following an intervention only on the middle turbinates. I quote the literature here: "Moore and Kern's work in 2001 first showed a supposed link between turbinal surgery and atrophic rhinitis. They published a retrospective study of 242 patients, who had been diagnosed with atrophic rhinitis between 1982 and 1999. Among them, 157 had a history of turbinectomy, of which

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	110 partial (lower and/or middle) and 47 total (3)." It is well said here "lower and/OR middle", which means that a simple intervention on the middle turbinates (without having to touch the lower turbinates) can lead to a snv. The proposition should therefore be reformulated as follows: "The NSV is characterized by the occurrence of a procession of nasal symptoms, associated with an extranasal repercussion, occurring more or less shortly after a gesture of reduction of the inferior turbinates AND/OR MIDDLE This gesture can also be associated with other gestures on the nasosinusian structures (nasal septum, sinuses, nasal pyramid)." So we must not minimize the impact that a turbinal gesture that would only affect the middle turbinates can have! for readability:
Expert 25	make several sentences rather than one too long I would have added the nasal
Expert 26	valve in the nasosinusian structures 7. Chhabra N, Houser SM. The
Expert 29	diagnosis and management of empty nose syndrome. Otolaryngol Clin N Am 2009;42(2):311-30, ix. http://dx.doi.org/10.1016/j.otc.2009.02.001 I
Expert 31	find this definition extremely broad, since the nasal symptoms do not require at least the sensation of paradoxical nasal obstruction (see ref 10 full text, Payne et al.) Especially since its evaluation (cotton test) is then the basis for the indication and control of the effectiveness of restorative surgical techniques.
Expert 32	I would replace "occurring" by ...may occur... Otherwise OK
Expert 36	after surgery
Expert 37	Okay, but what about patients with persistent nasal obstruction and/or aggravated with turbinal surgery with a "radical" post-surgical aspect and not showing this extranasal repercussion? Some authors in the bibliography seem to put these patients in the "syndrome empty nose". Should a separate box be created for these patients?

Proposition 3

It should be differentiated from atrophic rhinitis which may present the same nasal symptoms but which occurs outside of any context of turbinate reduction or endonasal surgery. (EA)

Missing values: 0
Minimum value: 1
Maximum value: 9
Median: 9

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Average: 8.37

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	1	0	1	0	0	1	2	2	29	1

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 5.56		94.44

Expert	Comments
Expert 11	there are many cases of atrophic rhinitis which appeared only at cause of interventions on the turbinates! however they also occur without the interventions! surgical gesture (shell)
Expert 13	
Expert 24	Absolutely. NSV is a purely iatrogenic condition. In all cases of VNS, patients have a history of turbinal surgery. That said, there are doctors who diagnose atrophic rhinitis (secondary) following turbinal surgery....so can we assimilate snv and secondary atrophic rhinitis? Some do, see here secondary atrophic rhinitis definition: https://www.techno-science.net/glossaire-definition/Rhinite-page-2.html For my part, I think it is essential to define the snv well by the fact that it results from a surgical operation on the turbinates and therefore to distinguish it from secondary atrophic rhinitis, the latter possibly being consecutive to different things.
Expert 30	It is very fair.

1.2. Impact

Proposition 4

The incidence of SNV after surgery on the turbinates remains largely unknown. There is no epidemiological study to rely on.

Missing values: 0

Minimum value: 4

Maximum value: 9

Median: 9

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Average: 8.45

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	0	0	1	1	1	1	6	26	1

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 2.78		97.22

Expert	Comments
Expert 5	the largely misunderstood term does not lead to my conviction because there are many articles demonstrating that SNV develops in very high rates of patients operated on for turbinectomy. Thus, Houser's study presenting a summary table of the various studies demonstrates this, as does the PASSALI study on a large panel of operated patients. Often, the term SNV is not used by the authors but the symptoms that make it up are described each time.
Expert 15	Normal since at the base the surgical gesture is "normal" and that no questioning about the consequences before touching the turbinates had been taken into account From the moment when it is said "The
Expert 24	exact incidence of the nose syndrome vacuum is not known, because no large-scale study has been conducted to estimate the incidence of VNS after turbinal surgery", perhaps it is time to do this "large-scale study"? Why not do it now?
Expert 26	I would have replaced by cannot be reliably estimated No information on
Expert 30	this subject, the patient is not informed by the medical profession of the risks incurred after the intervention.

1.3. Time to onset

Proposition 5 It is not possible, within the limits of current knowledge, to define an interval of occurrence between the performance of a procedure on the turbinates and the appearance of a VNS.

Missing values: 0

Minimum value: 2

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Maximum value: 9

Median: 9

Average: 8.22

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	1	1	0	0	1	4	5	25	0

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 5.41		94.59

Expert	Comments
Expert 5	According to the medical literature, the delay seems to be between a few weeks and three years. as far as I am concerned, the diagnosis was made after 18 months but the SNV appeared in the weeks following the turbinectomy. In reality, it must depend on the aggressiveness and extent of the surgical procedure.
Expert 9	how to eliminate in this case, the possible appearance independent of the surgical gesture, of a pathology of the nasal mucosa such as atrophic rhinitis at a distance from the turbinoplasty, if there is no time limit for taking into account the iatrogenic nature?
Expert 24	Absolutely, it is almost impossible to know in what time interval this pathology can occur following a gesture on the turbinates. "to define a STRICT interval..." and in this
Expert 25	case, I coast to 9 15 days after the operation, when the scabs fall off,
Expert 35	we feel the famous 'hole'

Proposition 6

Nevertheless, taking into account the healing times of the nasal tissues, taking into account the pathophysiological mechanisms considered below, it is reasonable to estimate that an VS has no reason (except new nasal gesture or change of remarkable environment) to settle beyond two years after a turbinal gesture. (AE).

Missing values: 0

Minimum value: 1

Maximum value: 9

Median: 9

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Average: 7.54

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	1	0	2	1	2	0	4	3	17	7

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 13.33		86.67

Expert	Comments
Expert 5	This is what seems to be observed even if we lack scientific studies on this subject.
Expert 6	Mucosal healing during turbinal procedures is most often acquired 3 months postoperatively. It can be estimated that, by analogy to cutaneous healing, non-visible healing phenomena can continue for up to 1 year postoperatively. It therefore seems more judicious to me to write "to settle one year after a turbinal gesture" and not two years.
Expert 9	A delay of 1 year after a surgical procedure seems more logical, compared to the usual delays of iatrogeny later symptoms ranging from several months
Expert 12	to several years after turbinal surgery (reference argument 4-7) physiopathological (shell) the time of Healing is variable and the effects can become bothersome
Expert 13	after several years as the turbinates
Expert 15	continue to change There are cases where people have developed snv years after their turbinate surgery. In any case, it is noted in black and white in the document that you have
Expert 24	attached to us: "Other authors report later symptoms, ranging from several months to several years after turbine surgery." This pathology being unpredictable, it is impossible to advance level of delays.
Expert 27	I agree but the duration of two years remains arbitrary
Expert 30	everything will depend on the patient's condition and the healing time of the nasal tissues. (different from patient to patient)
Expert 31	This proposal is not wrong, but the 2-year period seems very permissive to me. The healing time and rebalancing of physiological functioning

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	after endonasal surgery, except post-operative radiotherapy or lasting infectious complication, is in my experience a maximum of 3 months (possibly increased to 6 months for certain frontal surgeries) The occurrence of new symptoms between 6 months and 2 years after surgery is probably more likely to be related to somatization than to the surgery itself.

2. Pathophysiology

2.1. Pathophysiological mechanisms of the VNS: hypotheses

Proposition 7

The physiopathological mechanisms of NS are complex and probably multiple. They are not yet clearly elucidated.

Missing values: 0

Minimum value: 2

Maximum value: 9

Median: 9

Average: 8.42

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	1	0	0	1	1	2	3	28	1

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4 Zone 5 to 9		
Number of responses in % 2.78		97.22

Expert	Comments
Expert 5	The SNV mechanisms are related to the functions of the turbinates so they are for the most part clearly elucidated. Thus, the lower turbinates serve to moisten the air, and their absence leads to severe dryness and pain when air penetrates. It is the same for all the other functions of the horns. Headaches or facial pain appear to be caused by damage to the nerve

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	trigeminal. Already,in 1985, MOORE published that this operation should be condemned.
Expert 24	Hence the need for additional research/studies to "elucidate" the pathophysiological mechanisms of SNV. But one thing is certain: everything comes from the base of an intervention on the turbinates!
Expert 26	I would have added a point which seems essential to me even if it is not supported by studies: the insufficiency of information prior to a turbinal gesture, in particular in a patient predisposed to SNV, could also be a participating factor at the appearance of a VNS; It is reported by patients in the majority of legal proceedings. The pathophysiological mechanisms of VS need further investigation.
Expert 30	

Proposition 8

The turbinates, above all the inferior turbinates, have a major role in the nasal respiratory functions, in warming and humidifying the inspired air, as a barrier against airborne contaminants. They are also involved in the control of breathing and in the feeling of nasal respiratory comfort.

Missing values: 0

Minimum value: 4

Maximum value: 9

Median: 9

Average: 8.44

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	0	0	1	0	1	4	5	26	0

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 2.70		97.30

Expert	Comments
Expert 5	I issue a reservation because articles have shown that if the lower turbinates are missing, the air rushes into the hole left by the ablation of these and if it is the middle turbinates that are missing, the air rushes in a hole located a little higher in the nasal pyramid. in both cases, breathing is very

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	disturbed because the air must circulate in the meatus and meet a maximum of mucous membrane to moisten properly. If a hole is caused by the surgeon, whether at the bottom or in the middle, the deleterious effects are logically felt. So yes, the lower turbinates are bigger but no, the middle turbinates do not have a residual role. It is a set that must be respected in its entirety. I will delete the mention "above all the lower turbinates"
Expert 8	Ditto, does not apply only to the lower turbinates, the middle turbinates have the same functions of filtration, pressurization, heating and humidification of the inspired air.
Expert 15	yes clearly because I find it difficult to keep my calm by breathing and a constant discomfort on inspiration due to the imbalance on the operated side (too open therefore too much air on one side) which by this gene makes me irritable because absolutely constant. the turbinates
Expert 24	have a major role in respiratory well-being.
Expert 35	Medium cones too I have more, and all the functions are diminished

Proposition 9

The NO secreted in the sinuses is brought, via nasal breathing, to the level of the lungs and allows an adaptation of the vascularization in order to optimize the gaseous exchanges. It could also have an antiviral and antibacterial action.

Missing values: 0

Minimum value: 1

Maximum value: 9

Median: 9

Average: 8.00

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	1	1	0	0	1	0	4	5	20	5

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 6.25		93.75

Expert	Comments
Expert 5	It's too technical for me, but if this proposal goes in the direction of a

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	respect for the human body I am a priori in favor of it
Expert 7	I agree with the proposal but do not see the relation with the reduction turbine
Expert 13	antiviral and antibacterial (unify the spelling by antiviral) I was unaware of the
Expert 23	antiviral and antibacterial action I agree but, as the proposal says, the vast majority
Expert 26	of NO is secreted by the sinuses (and the bronchi) and I therefore do not really see the link between turbinate, SNV and NO. The reference on NO and turbinectomy is moreover of a very low level of evidence. yes, on the other hand in the physiopathology chapter this sentence comes a little out of context: this is embarrassing
Expert 27	for understanding To be deepened
Expert 30	

Proposition 10

Conversely, pathologies affecting the turbinates, above all the lower ones, can alter these different functions and be responsible in particular for nasal obstruction.

Missing values: 0

Minimum value: 1

Maximum value: 9

Median: 9

Average: 8.28

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	1	0	0	1	1	0	2	5	26	1

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 5.56		94.44

Expert	Comments
Expert 5	I do not understand this proposal because is it SNV pathology or pathologies that have led to a proposal for turbinectomy? I always express a reservation on the reduction of the role of the middle turbinates because many articles show that their ablation produces the same effects. For my part, it is the lower turbinates that have been removed from me but I reason in view of my readings and

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	testimonials heard Once again, if this proposal goes in the direction of preserving the integrity of the human body, I am in favor of it. If it is a question of saying that a pathology of the turbinates can reduce the gaseous exchanges and that it is thus necessary to cut them, I am unfavorable to it. indeed, I am much worse since my cones were cut and even if before I often had a stuffy nose, my quality of life was only slightly altered..
Expert 7	very blurry. I do not understand the "A contrario" which begins the proposition; contrary to what? "may alter these different functions": we are talking about those of proposition 10 or 9?
Expert 15	if too bulky I would
Expert 24	rephrase the proposal like this: "A contrario, the pathologies affecting the CORNETS can alter these different functions and be responsible in particular for nasal obstruction." Here I think that we should not make a distinction between the lower and middle turbinates because the latter can also be affected by pathologies that can lead to nasal obstruction (example: polyps, concha bullosa, etc...).
Expert 30	ENT disorders
Expert 35	Medium cones too (my case)

Proposition 11

Instrumental gestures and surgical gestures on the turbinates, above all lower, used to respond to a problem of chronic nasal obstruction, can also lead to alterations in the functions of the turbinates contributing to the development of a VNS and explaining in particular its most common symptom, paradoxical nasal obstruction.

Missing values: 1
Minimum value: 4
Maximum value: 9
Median: 9
Average: 8.35

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

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Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	0	0	1	0	0	5	8	21	1

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 2.86		97.14

Expert	Comments
Expert 5	Always the same reservation on the reduction of the middle turbinates because the air will always circulate where the hole is and therefore in the event of absence of middle horns, the role of the lower horns will be reduced because the air will only go little to their contact, preferring to rush into the hole left by the absence of the middle cones. yes, from the first cause, very open
Expert 15	nose and paradoxically, gene indeed the air enters too quickly which also creates a dry nose with crusts, a suction cup effect on inspiration strangely we do not talk much about this mechanical effect I agree on the substance but I find the sentence very unclear.
Expert 21	It would be more appropriate to say: "Instrumental or surgical turbinate reduction, mainly inferior, performed in response to a complaint of nasal obstruction can lead to alterations in turbinate function contributing to the development of VS. These alterations are responsible for the symptoms of VNS including paradoxical nasal obstruction. Why target the paradoxical ON at this stage?
Expert 24	I will reformulate the proposition as follows: "Instrumental gestures and surgical gestures on the LOWER AND/OR MIDDLE turbinates, used to respond to a problem of chronic nasal obstruction, can also lead to alterations in the functions of the turbinates contributing to the development of 'a VNS and explaining in particular its most frequent symptom, paradoxical nasal obstruction." I suggest this modification because in the scientific argument, it is written: "In numerical simulation of flows, Naftali et al. estimated that the middle and lower turbinates are responsible for 70% of the air conditioning capacity of the pits nasal cavities, and that amputation of the turbinal structures reduces the effectiveness of air conditioning in the nasal cavities by almost 30%. So this excerpt suggests that the middle turbinates are just as important as the lower turbinates. They must therefore be placed on the same footing.
Expert 35	medium cones also thank you for specifying it

Proposal 12

The paradoxical qualification is due to the fact that a turbinal reduction has been performed to correct an obstruction, and while this reduction enlarges the diameter of the nasal passage for the passage of the

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air flow, the patient feels an obstruction which would mechanically have less or no more reason to exist.

Missing values: 0

Minimum value: 7

Maximum value: 9

Median: 9

Average: 8.78

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	0	0	0	0	0	1	6	29	1

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 0.00		100.00

Expert	Comments
Expert 5	A reservation however: doctors should and should never have been unaware that a human being does not function like a pipe and that it is not enough to cut what has been given to us by nature to solve a problem. This supposed paradox has a good back because in reality, the tissues of which the turbinates are made include goblet cells or goblet cells which trap the various pollutants and receptors which make it possible to perceive the contact with the air and to regulate the flow. . Personally, I was always very surprised to find that before my operation, when I jogged, my nose came out spontaneously and I breathed perfectly. the human body is well made and the need for oxygen made the nose react accordingly. to conclude, the obstruction is paradoxical only at first glance because in reality, if the receptors are cut, it is logical that the patient no longer feels the air passing through his nose and still feels it blocked! This expression actually exonerates doctors and is very simplistic. Would you qualify as paradoxical the pain of an arm amputee on the grounds that he cannot suffer from a missing limb? ditto unclear and to be
Expert 21	rephrased. Nasal obstruction in the SNV is described as paradoxical because the patient describes nasal obstruction despite sufficient passage of air in the nasal cavities

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Proposition 13

Data which deserve to be confirmed suggest that anatomo-functional links exist between the nerve centers and the receptors of the nasal mucosa. The co-existence of hyperventilation with the SNV and symptomatic improvement with rehabilitation go into this sense.

Missing values: 0

Minimum value: 5

Maximum value: 9

Median: 9

Average: 8.43

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	0	0	0	1	1	3	7	23	2

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 0.00		100.00

Expert	Comments
Expert 5	It's technical but if it goes in the direction of preserving the human body, I'm in favor of it.
Expert 6	This is an unproven hypothesis, should it be written in a recce???
Expert 26	I would have specified the respiratory central nervous centers
Expert 27	links
Expert 31	links are missing an s
Expert 34	...suggest that DES links anatomo-...

2.2. Etiologies of VNS

Proposition 14

By definition, the occurrence of a VNS requires the prior performance of a turbinal gesture. It is reasonable to link the syndrome of the empty nose above
all: - to the gestures on the inferior
turbinates - and to the importance of the turbinal reduction. (grade C)

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Missing values: 0

Minimum value: 1

Maximum value: 9

Median: 9

Average: 7.52

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	2	0	1	3	1	2	0	5	21	2

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 17.14		82.86

Expert	Comments
Expert 5	I observe that all of the questions link the occurrence of VNS to the removal of the inferior turbinates above all. I agree with the link on the importance of the turbinal gesture but in my opinion, one should in NO CASE suggest that the gesture on the middle turbinates would be without consequences because we would thus have the same problem in 10 years, the ENT rushing into the breach by performing medium turbinectomies to replace the old lower turbinectomies which have become prohibited. Etiology rather than etiologies. Etiology is the study of causes and remains in the singular. removing a mucous membrane
Expert 13	with nerve endings can only be risky those who do not develop anything may have simply learned to
Expert 15	live with it without even realizing it or are just occasionally embarrassed or simply afraid to return to have surgery or so their ENT told them that it was in their heads that they have to go see a shrink if they are not aware of the SNV
Expert 16	And on medium cones. "A series of 24 cases of VNS including 14 after a procedure involving the inferior and middle turbinates and 3 after a procedure involving only the middle turbinates (41)." 41. Saafan ME. A cellular dermal (alloderm) grafts versus silastic sheets implants

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	for management of empty nose syndrome. Eur Arch Otorhinolaryngol 2013;270(2):527-33. http://dx.doi.org/10.1007/s00405-012-1955-1
Expert 19	And on medium cones (9-30)
Expert 24	I do not necessarily agree on the importance of turbinal reduction because it implies that the more important the procedure, the greater the chances of occurrence of snv. However, as Houser recognizes, there is a group, ENS-type patients, who have a history of turbinal surgery and in whom no loss of turbinal tissue is visualized and who nevertheless present with SNV symptoms, which means that even a small extent/intensity act on the turbinates can trigger an unpredictable snv. Hence once again the absolute necessity of giving an information sheet to all patients before any procedure on the turbinates, including in outpatient procedures. So even a minimal movement on the cones can trigger snv without really knowing why. Furthermore, I do not agree that the snv is above all linked to the gestures on the lower turbinates. In the literature that you provide, it is said on the one hand, that there are many cases of snv following a procedure only on the middle turbinates: "A series of 24 cases of SNV including 14 after a procedure relating to the inferior and middle turbinates and 3 after a gesture bearing only on the middle turbinates (41)." On the other hand, it is said: "The cohorts of the literature studying SNV occurring after middle turbinectomy are less numerous than those dealing with cases occurring after inferior turbinectomy." And it is also said: "the authors did not find any harmful effect after middle turbinectomy in comparison with the preservation of the middle turbinates, but this review is limited by the low level of evidence of the available studies." So with these 2 quotes, we have the confirmation that few data are collected on the gestures concerning the middle turbinates; and it is precisely because there are few quantified studies concerning gestures on the middle turbinates that we absolutely cannot deduce that the cases of snv are weak (or non-existent) following a gesture on the turbinates means. Finally, apart from the literature, I know people who have developed an snv following a gesture only on the middle turbinates. So once again, we must not neglect the consequences that a gesture, which would take place only on the middle turbinates, can have in the occurrence of the snv.
Expert 25	this does not seem totally explicit to me in the argument ET
Expert 29	LES CORNETS MOYEN41. Saafan ME. A cellular dermal (alloderm) grafts versus silastic sheets implants for management of empty nose syndrome. Eur Arch Otorhinolaryngol 2013;270(2):527-33. http://dx.doi.org/10.1007/s00405-012-1955-1

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Expert 35	NO MEDIUM turbinates also, I am the proof of it Steven HOUSER explained it to me, a simple resection of the tissues of the septum can cause a SNV. Please put in sentence 'AND to the importance...' 'OR to the importance...' The SNV also affect turbinate means

Proposition 15

Since large lower turbinectomies (> 1/3 of the volume) are the most at risk of occurrence of an empty nose syndrome, it is recommended to proscribe them when they are intended to correct a functional obstructive disorder (AE).

Missing values: 0

Minimum value: 3

Maximum value: 9

Median: 9

Average: 8.00

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	0	2	1	1	1	4	4	23	1

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 8.33		91.67

Expert	Comments
Expert 5	one more reservation because the average cones are therefore negligible. Without being truly qualified, if the problem with the middle turbinates is less known, it is probably because the ablation of the middle turbinates has been practiced less so, do you want to relaunch this practice?
Expert 6	We could add "except in very special cases such as fibrous dysplasia or pathology tumor"
Expert 7	I think you should replace > 1/3 volume by > 1/2 volume
Expert 23	this notion of 1/3 volume seems vague to me, it seems to me to depend on the size and the initial mucous volume of the turbinate. moreover we should perhaps speak of the anatomical zone of the turbinate which is reduced :

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	head or tail of the cornet?
Expert 24	Absolutely. Already, even with minimally invasive interventions on the turbinates, an snv can be triggered, so there is no need to take additional risks. These wide lower turbinectomies are to be avoided in obstructive disorders functional.
Expert 26	Agree on the substance but very risky to specify a measurement of the turbinates because patients with VNS are extremely picky and risk asking for pre-operative measurements of the turbinates which will not be available since the CT scan is not systematic or mandatory in case of treatment of a turbinal obstruction of the chronic rhinitis type. In addition, a systematic preoperative CT scan is at risk of not showing turbinal hypertrophy because it can fluctuate depending on external conditions. Could we instead recommend adapting the size of the resection in order to resect as little turbinal tissue as possible?
Expert 30	Totally agree
Expert 31	Reading this sentence, we seem to index the importance of the resection on the initial volume of the turbinate (resection of > 1/3 of the initial volume), unless a misinterpretation is possible (resection retaining at least 1/ 3 of the cornet?). This notion does not appear in the argument. It seems more relevant to focus on the residual volume as suggested by Gil et al. (ref 12 of the argument, which rather targets a residual volume of 50%), and perhaps even more to the minimal preservation of relief of the lateral wall by preserving a lower meatus (personal opinion) And then on what basis to evaluate a reduction of 1/3 of volume: the scanner gives images which fluctuate according to the nasal cycle. endoscopic description is never precise enough. On the other hand, it seems important to me to recall the non-indication and to proscribe total turbinectomies in this indication (confirmation and reaffirmation of the SFORL recognition)

2.3. Contributing factors

Proposition 16

There are no contributing factors known to date.

Missing values: 0
Minimum value: 1
Maximum value: 9
Median: 9
Average: 8.13

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Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	1	1	0	0	0	1	4	3	23	4

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 6.06		93.94

Expert	Comments
Expert 15	given what I have read on the reports, can we say that if
Expert 18	proposition 15 above is in contradiction with proposition 16 axio depressive terrain?
Expert 23	second surgery for nasal obstruction?
Expert 24	Hence the need for studies/research in this direction.
Expert 30	No factors known to date

3. Prevention

Proposition 17

Preventive actions are essential in order to minimize the risk of occurrence of VNS.

Missing values: 0

Minimum value: 4

Maximum value: 9

Median: 9

Average: 8.67

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	0	0	1	0	1	0	4	30	1

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HAUTE AUTORITÉ DE SANTÉ

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4 Zone 5 to 9		
Number of responses in % 2.78		97.22

Expert	Comments
Expert 5	One could add: and prevention information but
Expert 8	also information Irreversible consequence I was
Expert 10	not warned of the risks after this
Expert 15	operation Basically it was for straightening of the nasal septum and nothing else! I was followed psychologically and it did not challenge the surgeon who operated on me twice 6 months apart without asking my opinion to touch the cones
Expert 24	Absolutely. Unfortunately, preventive actions are not necessarily applied by all ENTs these days. An effort must be made at this level.
Expert 30	Preventive actions must imperatively be put in place with the patient in order to reduce the risk of VNS as much as possible (today little known).
Expert 36	It seems interesting to better understand the functional disorders of the orofacial sphere in particular: day and night mouth ventilation privileged upper thoracic breathing poor posture labial incompetence poor resting lingual position verbal orality disorders (anteriorization on certain phonemes) alimentary orality disorders/smell and taste disorders These functional disorders of the orofacial sphere are often found in sleep disorders/OSAS and attention/concentration disorders

Proposal 18 In the face of chronic nasal obstruction, it is recommended to perform a nasal endoscopy, if necessary supplemented by a CT scan, in search of an inflammatory, tumoral, pseudo-tumoral or infectious cause that would require specific management (AE) .

Missing values: 0

Minimum value: 6

Maximum value: 9

Median: 9

Average: 8.84

Quote value	Wording
1	Total disagreement

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9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	0	0	0	0	1	0	3	32	1

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 0.00		100.00

Expert	Comments
Expert 26	In my opinion, it should also be specified that a CT scan not showing turbinal hypertrophy does not eliminate the diagnosis of nasal obstruction of turbinal origin which can fluctuate depending on external conditions.
Expert 30	A support would be more than necessary
Expert 32	I would formulate this recognition as follows: In the face of chronic nasal obstruction, it is recommended to perform a nasal endoscopy, if necessary supplemented by a CT scan, and to look for an inflammatory, tumoral, pseudo-tumoral or infectious cause that would require specific management (AE).

Proposition 19 It
is then recommended to seek the architectural, mucosal or mixed origin of the chronic nasal obstruction based on: - the characteristics
of the obstruction, - the findings of the
clinical examination, - a clinical test with
local vasoconstrictors (in the absence of contraindications). (EA)

Missing values: 0

Minimum value: 4

Maximum value: 9

Median: 9

Average: 8.53

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Machine Translated by Google

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	0	0	1	1	0	1	6	27	1

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 2.78		97.22

Expert	Comments
Expert 3	it seems important to me to note the contraindications of the test to local vasoconstrictors
Expert 9	the clinical vasoconstrictor test may be falsely conclusive if there is a mixed mucosal and architectural pathology. In addition, some patients with perceived improvement present pure qualitative pathology without frank turbinal hypertrophy. morphology of the nose possibly a clinical test with a vasoconstrictor. You may
Expert 10	need to qualify
Expert 27	the use of this test.
Expert 30	Totally agree

Proposition 20

The results of nasal instrumental exploration (rhinomanometry and/or acoustic rhinometry) with vasoconstrictor provocation tests (in the absence of contraindications) can be very useful for the characterization of chronic nasal obstruction and the therapeutic decision (AE).

Missing values: 0

Minimum value: 3

Maximum value: 9

Median: 9

Average: 8.36

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	0	1	0	1	2	1	4	25	3

Distribution by area in percentage excluding values of type I cannot answer

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Rating scale Zone 1 to 4 Zone 5 to 9		
Number of responses in % 2.94		97.06

Expert	Comments
Expert 6	I would have added "but must not be carried out systematically" so as not to wrongly incriminate a practitioner who has not carried them out before a surgical procedure, when this type of examination is not feasible everywhere and to way current
Expert 24	Absolutely, so why aren't these examinations systematically prescribed before any intervention on the turbinates? Efforts must be made in this direction.
Expert 27	this technique is currently not very accessible, not very reproducible and controversial. it is only carried out in very few centers, perhaps it is necessary to qualify (remove the very)
Expert 30	An instrumental exploration should in my opinion be carried out for this type of pathology without practical
Expert 31	experience of these instrumental evaluations.

Proposal 21 In

the event of performing a septoplasty or rhino-septoplasty intended to correct a chronic nasal obstruction of architectural origin, it is recommended not to perform any associated turbinal procedure in first intention (AE).

Missing values: 0

Minimum value: 1

Maximum value: 9

Median: 9

Average: 7.42

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	1	2	1	3	2	0	1	1	23	3

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4 Zone 5 to 9		
Number of responses in % 20.59		79.41

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Expert	Comments
Expert 5	Yes, who can do more can do less. If in my case, we had started with a septoplasty, we could then have seen and done things in stages rather than realizing the irreversible. Logically, you have to go little by little and avoid irreversible gestures at all costs. A slightly cropped cone will be able to regain volume more easily than if it is cut at the root. that's what was written by the way DESIGN.
Expert 6	There is often a compensatory hypertrophy of the inferior turbinate in the concavity of a septal deviation, explaining intermittent bilateral obstructions when the septal deviation is only on one side. In these frequent cases, it may be useful to perform an associated turbinal reduction procedure so as not to multiply iterative procedures. Or a conservative procedure, with small volume resection, in a patient presenting with chronic
Expert 9	rhinitis associated with architectural pathology.
Expert 21	I will add "...intended to correct chronic nasal obstruction of ISOLATED architectural origin, it is..."
Expert 24	Absolutely.
Expert 26	I would have specified "predominant" architectural origin because exclusively architectural nasal obstructions are not the most frequent and are most often combined with a mucous part
Expert 27	Can be specify PURELY architectural because a rapid reading of this recommendation can make think that the association of the two surgeries is not desirable. Beyond that, even if there is no there is no scientific evidence against or in favor association of a turbinal gesture with a septal gesture, nor even very marked recommendations (except perhaps Han et al 2015 but expert consensus), it is a gesture that remains very common and in the experience of many of us very helpful.
Expert 30	Yes, so as not to mutilate the patient.
Expert 31	Attention here we do not specify 1. that we are talking about the inferior turbinate (a very voluminous concha bullosa, even if it is not responsible for the nasal obstruction, can by its position in the case of severe septal deviation prevent any repositioning of the septum)=> specify action on the inferior turbinates 2. specify architectural origin PURE because when associated rhinitis is insufficiently controlled by medical treatment, this injunction exposes the surgeon to almost certain partial therapeutic failure. 3.Even with these modifications, this negative proposal will make people cringe... Can we not consider it is not recommended to...
Expert 32	NO. It all depends on the results of the explorations and the final diagnosis of the pathology Agree if frank
Expert 37	obstructive septal deviation not to propose a gesture

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	immediately on the cones Disagree if unilateral spur associated with turbinal hypertrophy associated in particular with suggestive clinical characteristics ("mucosal" signs but predominance on the side of the spur) and/or instrumental (rhinomanometry and/or acoustic rhinometry). No study demonstrating an increased risk of VNS in the event of a (rhino)septal procedure associated with a turbinal procedure. To also balance the possible need for a second general anesthesia and its constraints in often young patients. Interest in these mixed situations to propose rather systematically, if possible, an instrumental examination.

Proposition 22

In case of suspected mucous or mixed origin, the etiology, in particular allergic, must be sought with the appropriate means (diagnosis of rhinitis, diagnosis of allergy).

Missing values: 0

Minimum value: 7

Maximum value: 9

Median: 9

Average: 8.87

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	0	0	0	0	0	1	3	33	0

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 0.00		100.00

Expert	Comments
Expert 5	Of course, anything that is non-invasive should be tested first.
Expert 7	I would change the term "mucosa" by the term "vasomotor"
Expert 10	Avoid touching the cones as much as possible.
Expert 30	A diagnosis must be made
Expert 36	Hypersensitivity +++

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Proposition 23 It is recommended to always start with medical management adapted to the etiology and to wait at least three months before evaluating its efficacy (AE).

Missing values: 0

Minimum value: 2

Maximum value: 9

Median: 9

Average: 8.63

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	1	0	0	0	0	2	3	31	0

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 2.70		97.30

Expert	Comments
Expert 7	I would suggest the period of "at least two months"
Expert 15	only the specialists who have the data can say it Unless the recognition
Expert 26	aims to oblige to make a systematic medical treatment in all the cases of nasal obstruction, the cases of exclusively architectural obstruction do not appear to me to concern a medical treatment of test. I would have reserved the trial medical treatment for mixed nasal obstructions or mucous membranes
Expert 30	Totally agree
Expert 32	6 months to a year if we are in front of an allergic patient treated by ITA for an allergy to house dust mites
Expert 36	by proposing preventive actions in order to help the patient improve his naso-nasal ventilation.

Proposal 24 In the event of symptomatic failure of the medical management, after verification of compliance with the treatment and new clinical examination, if there is a remarkable discrepancy between the intensity of the obstruction felt by the patient and the clinical examination, it is recommended to carry out a computed tomography and a rhinomanometry if they have not been performed beforehand (AE).

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Missing values: 0

Minimum value: 4

Maximum value: 9

Median: 9

Average: 8.59

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	0	0	1	1	0	1	4	29	1

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4 Zone	5 to 9	
Number of responses in % 2.78		97.22

Expert	Comments
Expert 21	I would modify: "rhinomanometry" by "nasal instrumental exploration (rhinomanometry and/or acoustic rhinometry) with vasoconstrictor provocation tests (in the absence of contraindications)"
Expert 27	highlighting rhinomanometry is problematic because it is not accessible. Nuancing the use of rhinomanometry seems desirable if we wish have applicable recommendations. I express my opinion only. agreement on the principle, difficult
Expert 31	implementation given the national equipment in rhinomanometers on the territory (but if this recce can make it possible to justify the equipment needs..

Proposition 25 If
the rhinomanometry confirms this discrepancy, it is recommended to look for a possible functional disorder before any surgical decision (AE).

Missing values: 0

Minimum value: 3

Maximum value: 9

Median: 9

Average: 8.45

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Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	0	1	2	0	0	0	4	29	1

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 8.33		91.67

Expert	Comments
Expert 3	can we cite an example of a functional disorder
Expert 21	Same I would modify: "rhinomanometry" by "nasal instrumental exploration (rhinomanometry and/or acoustic rhinometry) with vasoconstrictor provocation tests (in the absence of contraindications)"
Expert 26	Functional disorder = it's a bit vague. I would have proposed to deepen the investigations by looking for dynamic nasal anomalies (valve syndrome, vasomotor dysfunction), anomalies of naso- pulmonary coordination, a psycho-somatic context, signs in favor of diseases rare naso-sinuses.
Expert 27	Same
Expert 36	naive question: when do we look for a possible functional disorder?

Proposition 26 If
there is no remarkable discrepancy between the intensity of the obstruction felt by the patient and the clinical examination, a turbinal reduction procedure can be proposed. It is recommended to favor the techniques with the least risk of occurrence of a VNS, turbinoplasties (AE).

Missing values: 0

Minimum value: 1

Maximum value: 9

Median: 9

Average: 7.89

Quote value	Wording

Machine Translated by Google

1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	1	0	1	1	1	1	4	5	21	2

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 8.57		91.43

Expert	Comments
Specialist 2	"Less risky" techniques can cause SNV. The studies deserve further investigation for radiofrequency, a relatively recent technique compared to the others. For example cauterization or laser can cause side effects irreversible. The information should also be clear before these interventions.
Expert 5	A reservation: the turbinoplasty must be as conservative as possible, even if it means starting the procedure again later. As far as I am concerned, the consequences of the operation were an infection of the maxillary sinuses and the ENT doctor suggested a meatotomy. I refused and went to see an accupuncturist, the sinuses cleared after three months of treatment. Why not include this non-invasive therapy in the recommendations before any surgical procedure?
Expert 24	Yes, on the condition that the patient receives an information sheet on ALL the risks, even minimal, that such an intervention can cause. I would have said "the most conservative
Expert 26	techniques of turbinal anatomy" once again we have no proof that one technique is more at
Expert 27	risk than another, in these conditions it is difficult to favor one, Perhaps the amount of damaged tissue is in question, but we are not not even sure. All we know is that total turbinectomy is more risky, but when it comes to partial turbinectomy and laser, that's less clear. to date there is no study it seems to me that has shown the superiority of one technique over another (Harju et al 2018, Sinno et al 2016), nor even the effectiveness of turbinal surgery ! (Jose and Coatesworth 2010). less risky techniques = totally agree
Expert 30	
Expert 31	I agree on the substance, but not on the classification of artial trbinectomies in the category of non-conservative treatments the term turbinoplasty in question here, if we refer to the argument, only covers cauterization type techniques , radiofrequency / coblation /

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	microdebrider / cryotherapy . It is important to define this term turbinoplasty in the receipts and the text of the receipts, so that the opinion of the proofreaders is expressed in coherence with their convictions and their own definition Or else affirm the statement in the negative if the will is to banish partial turbinoplasties from 1st intention turbinal reduction procedures

Proposition 27

In the event of symptomatic failure of the turbinoplasty, it is recommended to perform a new clinical assessment, imaging and instrumental tests (rhinomanometry and/or acoustic rhinometry) with vasoconstrictor provocation tests (in the absence of contraindications). -indication) before any decision for more invasive turbine surgery (EA).

Missing values: 0

Minimum value: 2

Maximum value: 9

Median: 9

Average: 8.20

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	1	0	0	3	1	2	3	26	1

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 2.78		97.22

Expert	Comments
Expert 5	What bothers me here is: before any decision for more invasive turbulent surgery. I hope it's not about turbinectomy anymore?
Expert 7	no agreement from the moment the assessment with rhinomanometry had been done initially
Expert 26	I would have added at the end before anything before any decision for more invasive turbinal surgery "or new turbinoplasty"
Expert 27	nuance the rhinomanometry (possibly rhinomanometry)
Expert 31	Apart from a possible medico-legal interest (and debatable given the radio-clinical discordance in this indication), I do not see the interest of a new

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	imaging, in a patient already taken care of with a scanner 3 months earlier No turbinate surgery,
Expert 35	the risk of haemorrhage is high. You cut off one end, and if the bleeding is strong, the entire turbinate may be gangrene (my case).

Proposition 28

If there is a remarkable discrepancy between the intensity of the obstruction felt by the patient and the results of the assessment, in particular of the instrumental tests, it is recommended to seek a psychiatric opinion before any new surgical decision. (EA)

Missing values: 0

Minimum value: 1

Maximum value: 9

Median: 9

Average: 7.39

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	2	2	1	0	2	1	5	1	22	1

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 13.89		86.11

Expert	Comments
Expert 5	in case of discrepancy, the first consideration should be the diagnosis of the SNV before sending to the psychiatrist. In a second step, of course, the psychiatrist will be useful for the management of the VNS and also to assess the patient's ability to withstand a new restorative intervention. Indeed, a hypersensitivity can increase in my opinion an intolerance to a new surgery. a modification of the human body can be very badly tolerated on the psychological level. At the same time, it is the first turbinectomy operation that is the most invasive and disruptive. Placing an implant is a small thing compared to the initial removal of two perfectly healthy tissues in most cases.
Expert 6	Not very easy in practice!!!
Expert 7	it is recommended "not to practice any new procedure"

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Expert 15	yes essential, I know what I'm talking about, seeing a shrink and not having informed me of the risks is a professional error especially since it is an irreversible gesture and which does not offer reparation therefore amplifies the anxieties in conclusion people very psychologically fragile are to be excluded if it risks worsening their condition due to the SNV or sign a discharge proving that they are well aware of the risks as all of them do not agree to seek a psychiatric opinion, the patient is aware of his or her
Expert 30	state
Expert 36	the feelings of the patients must be taken into account by favoring if possible a work of breathing/ relaxation which can be proposed before the psychiatrist opinion.
Expert 37	What to think of a referral to a psychologist, often less connoted than a referral to a psychiatrist, even after discussion with the patient?

Proposition 29

In all cases, before any turbinal procedure, the patient must be informed about the risk of occurrence of VNS.

Missing values: 0

Minimum value: 4

Maximum value: 9

Median: 9

Average: 8.55

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	0	0	2	1	0	0	3	31	0

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 5.41		94.59

Expert	Comments
Expert 5	It should be added that the information must be provided within a minimum period of three months before any operation and the doctor must be able to justify this in writing dating at least three months before the act and signed by the patient. The absence of this writing prohibits any operation which must be authorized by the director of the hospital. In fact, a third party is needed to verify that the patient has been informed. For my part,

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	I was never informed of anything. I just thought I was going through a straightening my wall.
Expert 6	Okay before turbinectomy, months okay before turbinoplasty...
Expert 8	On the risk but also on the frequency which is far from trivial (from 8% to 22% according to studies). It is important that the patient knows that these risks are not "exceptional".
Expert 10	This risk must be indicated at each intervention. On the other hand, doctors who do not recognize the SNV will not inform the patient. I would specify again "before any
Expert 31	gesture of reduction of the inferior turbinates" and we must ensure that the patient has understood
Expert 34	this information

4. Diagnosis

Proposition 30

Diagnosis of VNS is based on questioning in search of a history of turbinal gesture, paradoxical nasal obstruction and other nasal symptoms (dryness, crusts, hypersensitivity to various stimuli, pain, rhinorrhea posterior, smell disorder) and extra-nasal (dyspnea, sleep disorders, attention disorders, anxiety disorders, depressive disorders) classically associated in this entity.

Missing values: 0

Minimum value: 5

Maximum value: 9

Median: 9

Average: 8.71

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	0	0	0	1	0	2	3	31	0

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 0.00		100.00

Expert	Comments
Expert 7	history of significant turbinal gesture (> 50% reduction) and bilateral
Expert 26	In order not to make a diagnosis by excess or too brutal, I would have first of all made

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	a recommendation to specify that the diagnosis of SNV requires a long clinical and paraclinical process before being affirmed

Proposition 31

The clinical and endoscopic examination of the nose is essential, it must endeavor to evaluate the turbinal volume and the possibly persistent vasoreactivity, and to look for other mucosal and architectural anomalies.

Missing values: 0

Minimum value: 6

Maximum value: 9

Median: 9

Average: 8.79

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	0	0	0	0	1	0	5	31	0

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 0.00		100.00

Expert	Comments
Expert 26	I would also have added the search for persistent dynamic anomalies (valvary collapse) I have mixed
Expert 27	feelings
Expert 30	

Proposition 32

The improvement of the symptomatology felt by the patient with the wet cotton test (artificial limitation of the nasal air passage by a partially obstructing vestibular cotton wool placed in different sites) is an additional argument in favor of the diagnosis of VNS. It is recommended to perform the wet cotton test. (grade C)

Missing values: 0

Minimum value: 1

Maximum value: 9

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Median: 9

Average: 8.43

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	1	0	0	0	0	1	2	4	25	4

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 3.03		96.97

Expert	Comments
Expert 5	The cotton test is a complementary argument but not the only argument because there are people who do not get better with cotton in their nose and yet they have SNV.
Expert 7	no objectivity of this test test that I
Expert 23	have never practiced
Expert 24	Absolutely. So why is this cotton test currently not systematically carried out in case of doubt by the ENTs? remove vestibular because it is not vestibular in
Expert 27	the studies it seems to me but placed at different sites to make up for the absence of a turbinate.

Proposition 33

Imaging is recommended allowing comparison with pre-existing imaging of the turbinal gesture if it exists and the assessment of the residual turbinal volume on a shareable document (AE).

Missing values: 0

Minimum value: 3

Maximum value: 9

Median: 9

Average: 8.29

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Machine Translated by Google

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	0	1	1	0	2	1	6	24	2

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 5.71		94.29

Expert	Comments
Expert 24	Yes, although imaging alone cannot exclude a case of snv.
Expert 27	The residual turbinal volume does not seem to be an indicator of empty nose syndrome (Thamboo et al). It may be putting practitioners and patients on the wrong track to have the volume compared. this one in case of turbinoplasty without snv is often impressive....
Expert 31	I agree (9/9) with the interest of imaging to evaluate the residual volume, but I do not see the interest in comparing it to the initial turbinal volume in the absence of a systematic mathematical link between the volume of turbinate withdrawn and probability of an SNV. Only the residual volume counts and its assessment, even if it is less shareable, seems to me even more relevant in endoscopy than in imaging.

Proposition 34

Rhinomanometry, more than acoustic rhinometry, is recommended to objectively rule out potential persistent nasal obstruction. (EA)

Missing values: 0

Minimum value: 1

Maximum value: 9

Median: 9

Average: 8.15

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	1	0	0	0	1	1	3	2	19	10

Distribution by area in percentage excluding values of type I cannot answer

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Rating scale Zone 1 to 4 Zone 5 to 9		
Number of responses in % 3.70		96.30

Expert	Comments
Expert 5	A reservation: is it an examination after the SNV to diagnose it or a pre-operative examination and therefore before SNV? If it is in the first case, the obstruction being paradoxical, the air will pass but the patient will complain of stuffy nose so the usefulness of this examination is residual. in any case, it is not likely to hurt and it will refine the diagnosis. the practical problem does not arise in these terms are side effects by the patient to be expected?
Expert 7	Risks? without sufficient practical experience in this field I do not have
Expert 30	experience of acoustic rhinometry. even if in view of its operating mechanism. it
Expert 31	seems logical
Expert 37	

Proposition 35

In all cases, it is recommended to assess the impact of the symptoms on the patient's quality of life (possibly using the SNOT-22 self-questionnaire) and to assess their impact in terms of family, social and professional life. (EA)

Missing values: 0

Minimum value: 2

Maximum value: 9

Median: 9

Average: 8.65

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	1	0	0	0	0	2	2	32	0

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4 Zone 5 to 9		
Number of responses in % 2.70		97.30

Expert	Comments
Expert 13	I have not seen the SNOT-22 questionnaire in the Appendices quid of the
Expert 25	SNOT-25?

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Expert 26	Completely agree on the need to assess the impact on quality of life, but I would have quoted all the questionnaires validated in French without limiting SNOT-22
Expert 31	what a pity to anchor in all the French-speaking recommendations exclusively the snot22 as the reference for the self-questionnaire of QdV. The content of the parenthesis seems superfluous to me in such a rec. (even if I appreciate the true value of the "possibly") taking charge of the feelings of the patients allows a more global vision of the SNV.
Expert 36	Thus the patient recognizes himself more easily in this very specialized medical universe. So-called nasal and extra-nasal symptom prevention actions will be better accepted.

Proposition 36 In the event of suspicion of an anxiety-depressive syndrome and/or remarkable discrepancy between the symptoms, the findings of the assessment and the impact on the patient's quality of life, it is recommended to refer the patient for a psychiatric opinion. (EA)

Missing values: 0

Minimum value: 1

Maximum value: 9

Median: 9

Average: 7.92

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	2	1	0	0	0	2	4	3	25	0

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 8.11		91.89

Expert	Comments
Expert 5	As far as I am concerned, the antidepressant treatment has helped me a lot to better support the symptoms of VNS Which anxiety and
Expert 13	depression scales to use? passage by the patient's referring
Expert 18	specialist in general medicine beforehand I do not really agree
Expert 30	

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5. Support

The management of SNV is not yet consensual in the literature, however :

Proposition 37

it is recommended to establish the diagnosis with the appropriate means, its recognition being an important step for the care of the patient, (AE)

Missing values: 0

Minimum value: 7

Maximum value: 9

Median: 9

Average: 8.84

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	0	0	0	0	0	2	2	33	0

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 0.00		100.00

Expert	Comments
Expert 30	Primordial
Expert 35	There's work The medical community is not trained in this sense and sometimes refuses to see the infirmity

Proposition 38

it is recommended to look for a hyperventilation syndrome and propose rehabilitation according to the results of the respiratory tests, (grade C)

Missing values: 1

Minimum value: 5

Maximum value: 9

Median: 9

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Average: 8.64

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	0	0	0	1	0	2	5	28	0

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 0.00		100.00

Expert	Comments
Expert 7	what is called hyperventilation syndrome should be defined
Expert 26	I would have rather proposed: screening for a hyperventilation syndrome either by a pulmonologist or by the Nijmejen questionnaire
Expert 36	With the possibility of finding the best solution so that the patient learns to breathe --> breathing/ relaxation with specialized therapists

Proposition 39 it

is recommended to always start with medical treatment, (AE)

Missing values: 0

Minimum value: 5

Maximum value: 9

Median: 9

Average: 8.64

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	0	0	0	1	0	2	5	28	1

Distribution by area in percentage excluding values of type I cannot answer

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Rating scale Zone 1 to 4 Zone 5 to 9		
Number of responses in % 0.00		100.00

Expert	Comments
Expert 36	the ideal medical treatment and care for the improvement of breathing.

Proposition 40

It is recommended to look for a possible functional disorder and/or an associated anxiety-depressive syndrome for specialized care. (EA)

Missing values: 1

Minimum value: 7

Maximum value: 9

Median: 9

Average: 8.62

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	0	0	0	0	0	2	9	23	2

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4 Zone 5 to 9		
Number of responses in % 0.00		100.00

Expert	Comments
Expert 30	I don't think it's related to an anxiety-depressive syndrome.

Proposition 41

For medical treatment, it is recommended to combine washings of the nasal cavities (saline serum, sulfur derivatives) with means of nasal humidification (moisturizing gel or ointment, humidifying aerosol) while limiting the frequency of their use for prevent the risk of reinforcing mechanisms and paradoxical aggravation of the disorders. In the event of local signs of infection, the use of antibiotics (oral, local) is possible in the absence of contraindications. In the event of local signs of inflammation, the use of local corticosteroids is possible in the absence of contraindications. (EA)

Missing values: 1

Minimum value: 2

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HAUTE AUTORITÉ DE SANTÉ

Maximum value: 9

Median: 9

Average: 8.03

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	1	0	1	0	3	2	8	19	2

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 5.88		94.12

Expert	Comments
Specialist 2	Saline serum, sulfur derivatives, corticosteroids can either burn or dry out (or both) the mucous membrane.
Expert 5	A reservation: some people sleep with a PPP-type device (for example AIRVO), which includes an integrated humidifier. I have not practiced it but this possibility should be open if it is effective, which seems to be the case for those who have tested it.
Expert 13	Example of sulfur derivatives. Example of moisturizing gel or ointment, humidifying aerosol. As a general practitioner, I have no idea of the medical devices mentioned.
Expert 15	treatments with sea water are irritating, treatments with drugs seem very limited to me. Should it be specified that
Expert 26	bacteriological samples are not compulsory to prescribe AB treatment in the event of signs of superinfection? avoid the use of antibiotics (not necessarily always suitable, cause
Expert 30	side effects: stomach disorders, etc.). In my case, I can no longer absorb antibiotics and corticosteroids. Following my multiple operations and treatments, they damaged my stomach (treatment under OMEPRAZOL) I would have deleted "... OF REINFORCING MECHANISMS AND..." it weighs down the sentence
Expert 34	
Expert 35	List these moisturizing products I have to offer and they are good. To be improved for patients with NSV. Steroids to avoid.
Expert 36	It is often difficult and delicate for each patient to find the right wash (from the phy serum pod to the nasal douche) and the rhythm of the washes.

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HAUTE AUTORITÉ DE SANTÉ

Proposition 42

The use of menthol inhalation which can provide a feeling of nasal respiratory comfort is also recommended. (grade C)

Missing values: 1

Minimum value: 2

Maximum value: 9

Median: 9

Average: 7.88

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	1	0	1	2	4	0	3	20	5

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 6.45		93.55

Expert	Comments
Expert 5	I haven't used it but it can't hurt
Expert 15	maybe I take Vicks tampon impregnated for inhalation by fumigation racemic camphor, levomenthol from time to time because it creates an inflammation an inspiration as needed Inhaling menthol (strong smell) can reinforce the feeling
Expert 17	of suffocation, a symptom already present with the SNV.
Expert 30	this could be a solution Through the
Expert 36	trigeminal system and the 'recognized' smell of mint, a possibility of working on olfaction, on the detection of odorous molecules and their transport...on breathing. the possible alteration of the function of the trigeminal nerve reinforces the idea of making patients aware of its perceptual-motor, respiratory possibilities and thus of improving its olfactory library, of recovering somatosensory sensations caused by the majority of odorous molecules.

Proposition 43

When prolonged medical treatment (>6 months) is insufficient to correct the symptoms and

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To reduce the impact of VNS on the patient's quality of life, surgical treatment aimed at restoring airflow resistance and decreasing nasal airflow velocity can be discussed. It is recommended to feed this discussion by (AE): - a complete assessment
(clinical examination, tomodensitometry, instrumental tests, cotton test), - a psychiatric evaluation.

Missing values: 0

Minimum value: 5

Maximum value: 9

Median: 9

Average: 8.26

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	0	0	0	1	2	6	4	22	2

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 0.00		100.00

Expert	Comments
Expert 5	Caution: the reduction in size leads to an increase in the speed of the flow at constant flow since the air must pass faster in a narrower passage, by definition, for the same volume of air flow. The terms: "reduce the speed of nasal airflow" therefore seems inaccurate to me. I am of course not opposed to a corrective operation but I think that the person should be given at least one year because they could be disappointed if the operation does not work. We must therefore first give time to time because the body can also adapt. I know what I'm talking about because I developed nasal polyposis which blocked my nose a bit and also my middle turbinates swelled up to compensate for the absence of the lower turbinates. it's not a panacea but for some people who have had only partial removals, the mucosa can regain volume over time. It is therefore necessary in certain cases to allow time to see if a favorable evolution takes place and not to rush in any case for a new surgery; Perhaps a non-invasive intermediate step such as the injection of fat or hyaluronic acid would be desirable, giving the patient the impression of getting better at first and giving him hope.
Expert 6	No personal experience of this surgery

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Expert 15	yes because I think that the drought and my stress is due to the too strong and rapid passage of the air on the operated side I even think that it is the cause of the flow in the throat of the mucus not really agree for a psychiatric
Expert 30	evaluation can we consider respiratory rehabilitation by methods
Expert 36	reconciling the body and the brain in the light of the neurosciences practiced by specialists (speech therapist, facial physiotherapist, psychomotrician, sophrologist).

Proposition 44

In the absence of studies with a high level of evidence, one technique cannot be recommended more than another, nor one filling material more than another. (EA)

Missing values: 0

Minimum value: 5

Maximum value: 9

Median: 9

Average: 8.34

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	0	0	0	1	3	3	3	23	4

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 0.00		100.00

Expert	Comments
Expert 5	I don't think so because we all know that synthetic materials are rejected more than others. According to Prof. de GABORY, there were good results with tricalcium phosphate, but the material is no longer produced due to the bankruptcy of the company that manufactured it. Alloderm seems to be the best material but it is not authorized in France. What about support for this operation? shouldn't autologous materials be preferred?
Expert 6	No personal experience of this surgery

Proposition 45

If surgical treatment is planned, it is necessary to clearly inform the patient about the

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technique and material used, the perioperative constraints inherent in anesthesia and surgery, as well as the non-negligible and difficult to predict risk of failure.

Missing values: 0

Minimum value: 4

Maximum value: 9

Median: 9

Average: 8.72

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	0	0	1	0	1	0	2	31	2

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4 Zone	5 to 9	
Number of responses in % 2.86		97.14

Expert	Comments
Expert 6	No personal experience of this surgery also specify that these
Expert 8	solutions, even if they bring relief, will however induce a degraded functioning compared to the situation of the patient before the surgery having caused the VS. This is to avoid raising false hopes. it's primordial
Expert 30	

Proposition 46 In
all cases, given the frequency of anxio-depressive disorders and their links with the intensity of VNS symptoms, multidisciplinary care including psychiatric care is recommended. (EA)

Missing values: 0

Minimum value: 1

Maximum value: 9

Median: 9

Average: 8.37

Quote value	Wording

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1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	1	0	0	0	0	3	1	4	27	1

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 2.78		97.22

Expert	Comments
Expert 5	Even if the SNV should not be psychiatrized, the fact of feeling listened to by a professional and talking about your difficulties cannot hurt
Expert 6	No personal experience of this surgery
Expert 30	to have
Expert 36	multidisciplinary ENT Pulmonologist --> sleep disorder Respiratory therapists Psychiatrist

6. Outlook

Progress in diagnosis / epidemiology / treatment

Proposition 47

As underlined on several occasions, we are sorely lacking in information in a number of fields concerning the VNS, both on its epidemiological aspects, its post-intervention onset times, the type of gestures triggering the VNS, the frequency of the various symptoms, the socio-family/ professional and psychiatric impact, the investigations carried out and the treatments implemented and their effectiveness.

The validation of the French translation of the ENS-6Q score would provide a more specific tool for assessing the quality of life of patients with VNS.

It seems important to propose the establishment of a national register of the SNV allowing the most exhaustive possible collection of these data for a real-life analysis of the practice of the various caregivers brought to take care of patients with SNV.

Missing values: 0

Machine Translated by Google

Minimum value: 5

Maximum value: 9

Median: 9

Average: 8.57

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	0	0	0	1	1	3	3	29	0

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 0.00		100.00

Expert	Comments
Expert 5	Excellent idea
Expert 15	yes we would be surprised at the number of people who will fit into people with SNV

Exploring Sleep Disorders During VNS

Proposition 48

Sleep disturbances are almost constant in the SNV, but they have not been characterized. Their origin is certainly multifactorial: nasal dysfunction (difficulty falling asleep and nocturnal awakenings), ventilatory disorders (sleep apnea, high resistance syndrome of the upper airways), anxiety and depressive disorders. It seems important to propose a prospective study of the sleep of these patients at best using a polysomnography and specific validated questionnaires, which will make it possible to better characterize these sleep disorders and their various components, to propose an adapted care. .

Missing values: 0

Minimum value: 5

Maximum value: 9

Median: 9

Average: 8.52

Quote value	Wording

Machine Translated by Google

1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	0	0	0	1	2	1	6	27	0

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 0.00		100.00

Expert	Comments
Expert 5	Indeed, I wake up every night mainly to scratch the inside of my nose and also to moisturize my mouth which becomes like cardboard from breathing only through it gene > gene
Expert 13	
Expert 15	yes because the air becomes noisy in the calm when it passes through the nostril especially when you are very tired sometimes a sleeping pill is necessary so much the noise becomes obsessive
Expert 18	Given the nature of the symptoms reported, the simple polygraph examination should be prohibited 2010 RPC rec reference journal of respiratory diseases, 2010 vol 27 supplement 3 in my opinion it is
Expert 34	necessary to add "... specific validated questionnaires AND A SLEEP AGENDA..."

Develop rehabilitation / rehabilitation approaches

Proposition 49 It emerges from the analysis of the literature and the experience of the caregivers involved in this recommendation that VS is more or less frequently accompanied by diurnal (and perhaps nocturnal) ventilatory disorders. The post-surgical decrease in nasal resistance and disturbances in the collection of signals normally picked up at the level of the nasal mucosa (increased airflow speeds, decrease in sensory sensors of the nasal mucosa, lack of humidification and thermoregulation of the airflow air, decreased nasal NO production) are most likely involved in ventilation control dysfunctions (the frequent association of VNS with a hyperventilation syndrome would be a good example of this). It would be interesting to explore these ventilatory disorders further and, at the same time, to develop methods 1/ of speech therapy by analogy with what exists in "mouth-breathing" patients and 2/ of specific respiratory rehabilitation perhaps inspired by the methods used to the point in the hyperventilation syndrome.

Machine Translated by Google

Missing values: 1

Minimum value: 6

Maximum value: 9

Median: 9

Average: 8.62

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	0	0	0	0	1	3	4	26	2

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 0.00		100.00

Expert	Comments
Expert 5	I also insist on the question of sleep with the assistance of a humidifier directly connected to the nose and: or the mouth for improved respiratory comfort.
Expert 10	All methods that can bring patients an improvement can only be beneficial.
Expert 15	yes indeed the speed difficult to control is a factor
Expert 27	are probably (e.g. for humification the evidence is currently very weak), and the decrease in sensors has not been measured. you must add 1/ speech therapy OR BY A PHYSIOTHERAPIST
Expert 34	SPECIALIZED IN ORO MYO FACIAL REHABILITATION...

Develop minimally invasive methods to reduce airflow

Proposition 50 In the vast majority of cases, it is the excessive sacrifice of part of the inferior turbinates that leads to the development of SNV. The excess passage of the air flow at the nasal level with reduced turbulence and acceleration of speeds makes it possible to explain the development of nasal symptoms (paradoxical obstruction, dryness, pain in particular with cold air, posterior rhinorrhea, etc.) and is probably involved in some extra-ENT disorders

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(dyspnea, hyperventilation, etc.).

Moreover, many authors suggest carrying out a wet cotton test aimed at partially closing the nasal cavities by looking for the symptomatic improvement perceived subjectively by the patient.

Some teams are working, thanks to the digital simulation of the flow of fluids, on a personalized / patient approach aimed at virtually recreating the right possible obstacle to the air flow in order to then be able to propose it surgically. These still experimental approaches will not be able to enter clinical routine for several years.

It seems important to develop minimally invasive approaches aimed at limiting nasal airflow. The development of potentially humidifying nasal vestibular filters by industrialists seems interesting even if their permanent wearing is unlikely. Intranasal injection into well-selected anatomical sites of resorbable compounds (for example: hyaluronic acid, autologous fat) could improve symptoms and quality of life but remains to be assessed. Furthermore, their success in a patient could be predictive of a good outcome from surgical implantation of non-absorbable materials.

Missing values: 1

Minimum value: 4

Maximum value: 9

Median: 9

Average: 8.14

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	0	0	1	2	1	3	4	19	6

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9	
Number of responses in % 3.33		96.67

Expert	Comments
Expert 5	A fat stem cell implantation study showed good results, superior to raw fat. could we not consider injections, for example, every three months, like patients suffering from chronic pathologies?

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Expert 8	Do not omit the importance of the middle turbinates, not only the lower turbinates.
Expert 13	What does "personalized / patient approach" mean?
Expert 21	is it really that: "with reduced turbulence" I would have said increase in turbulence from which pressure drop of the flow excessive sacrifice
Expert 27	is a strong and unscientific term that may need to be qualified? significant removal? "sacrifice" is an awkward term
Expert 35	Thinking of nasal prostheses that can relieve the patient J uses them in the summer and for sleeping, and that's really good (nose clip, fabric, etc.)

Dedramatize and democratize the psychiatric part of care

Proposition 51

The impact of VS in family, social and professional life is often major and goes beyond the simple framework of symptoms and associated disorders. Patients with VNS more easily develop an anxiety-depressive disorder and/or a characterized functional disorder which contributes to the forefront of these repercussions. Organ specialists, above all ENT specialists, caring for patients are often powerless (due to a lack of skills) to diagnose these disorders and help patients overcome them. It seems essential to us that patients with VNS be able to consult a psychiatrist who will be able to establish the correct diagnosis and guide treatment. This is not about “psychiatrizing” the VNS as feared by some patients.

For greater efficiency, exchanges of information and training actions seem important. It seems necessary for organ specialists to learn to master a few keys to the clinical screening of anxiety-depressive and functional disorders and thus be able to offer patients a consultation with a psychiatrist. Conversely, it is also important that psychiatrists receive more information about VS and its clinical particularities.

Missing values: 0

Minimum value: 6

Maximum value: 9

Median: 9

Average: 8.62

Quote value	Wording
1	Total disagreement
9	Total agreement
10	I can not answer

Distribution of responses by number rating

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Rating scale	1	2	3	4	5	6	7	8	9	10
Number of responses	0	0	0	0	0	1	2	7	26	1

Distribution by area in percentage excluding values of type I cannot answer

Rating scale Zone 1 to 4	Zone 5 to 9
Number of responses in % 0.00	100.00

Expert	Comments
Expert 5	A reservation: Anxio depression is only a consequence of the SNV and not its cause. It is possible that more fragile people will be more affected, but let's not confuse causes and consequences.
Expert 8	Yes, it is essential that the psychiatrists to whom patients can be referred are well informed about the SNV and the role of the turbinates, so as not to attribute a single psychological dimension to it.
Expert 13	seems > seems A > Conversely
Expert 15	yes because the SNV is misunderstood by many professionals of general medicine and psychiatrist the
Expert 30	psychiatric part can be scary (this aspect must be played down) ... who
Expert 34	participate in the foreground A (and not DE) these repercussions ...

General questions about all documents

Proposal 52

These recommendations were drafted by a working group after reviewing the available bibliographic data, synthesized by a project manager. Indeed, the project manager, during a so-called systematic review and synthesis of the literature phase, writes a "scientific argument" in which a critical analysis and a synthesis of the selected literature are carried out (after a systematic bibliographical search in order to identify and select the references that comply with the pre-established selection criteria).

Do you have any comments on the document entitled “scientific argument”?

Missing values: 1

Quote value	Wording
1	Yes
2	No

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Distribution of responses by number rating

Rating scale	1	2
Number of responses	5	31

Expert	Comments
Expert 8	Regarding the scientific argument, we absolutely cannot qualify as "exceptional" the occurrence of NSV when it concerns, according to studies, between 8% and 22% of patients having recourse to this type of surgery. This is however what is done by repeating on page 10 the words of SFORL. The adjective is therefore very badly chosen and it would be good not to repeat it. In this argument, it also seems irrelevant to me to include the study on page 45 because it only has one year of follow-up, whereas, as indicated on several occasions, SNV can occur several years after the surgical procedure. .
Expert 10	Difficult to read so many pages
Expert 13	Acronyms section No definition of the ADSS Score
Expert 14	On the merits: clear, detailed and well-conducted arguments On the form: some typos as in the paragraph OBJECTIVES "safety of the care provided to them" remove the "s" from their + some excessive punctuation marks including commas
Expert 25	the "narrative review" table is very dense, and the density detracts from the clarity of accessible information
Expert 26	Very complete argument
Expert 27	very nice job
Expert 32	Excellent review and analysis of the literature! reading
Expert 33	pages 35 to 153 is very tedious because of the choice of format in painting..

Proposition 53

Is the methodology used to draw up the recommendations clearly presented? (if not, specify other necessary information)

Missing values: 0

Quote value	Wording
1	Yes
2	No

Distribution of responses by number rating

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Rating scale	1	2
Number of responses	37	0

Expert	Comments
Expert 15	since research has only recently started

Proposal 54 Are
the issues, objectives and limits, as well as the target population and the professionals concerned, clearly presented?

Missing values: 0

Quote value	Wording
1	Yes
2	No

Distribution of responses by number rating

Rating scale	1	2
Number of responses	35	2

Expert	Comments
Expert 3	quote general practitioner, pulmonologist and somnologist if
Expert 15	all are aware that these are not symptoms that we invent
Expert 25	but cf initial response on the targets and on the objectives embedded in each other others
Expert 32	I will not mention in the targets concerned: "Patients consulting for a nasal obstruction and to whom a surgical intervention is proposed". Too broad because includes septoplasties The SNV is an exceptional complication which is already mentioned in the information sheet of the College. The delivery of SNV recommendations seems to me to be exaggerated
Expert 34	it is also necessary to sensitize the GENERAL PRACTITIONERS to this pathology

Proposal 55 All
the scientific information available to date is presented? (If not, please send us the missing items)

Missing values: 0

Quote value	Wording
1	Yes
2	No

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Distribution of responses by number rating

Rating scale	1	2
Number of responses	35	2

Expert	Comments
Expert 5	There are many articles in the medical literature. I don't think I've seen the studies done with adipose stem cells cultured before injection into patients. I believe I have seen a study by the city of Cairo on this subject, but it is not the only one; I think I put yes but I am not able to know if all the scientific information available to date is
Expert 15	presented.
Expert 24	So this is an answer by default.
Expert 25	I am unable to judge the completeness of the references
Expert 35	See STEVEN HOUSER study and MAYO CLINIC

Proposition 56

Do the recommendations correspond to the information analysed? (If not, propose a more suitable wording)

Missing values: 0

Quote value	Wording
1	Yes
2	No

Distribution of responses by number rating

Rating scale	1	2
Number of responses	36	1

Expert	Comments
Expert 5	Once again, the mentions: even more the inferior turbinates or others must in my opinion be deleted because the risk on the turbinates, even if less known because fewer people have undergone ablations of middle turbinates is nonetheless recognized.
Expert 15	I think
Expert 26	Some formulations proposed in my comments You did not make any recommendation on the legal procedures which are a form of recognition of the diagnosis and of resilience for certain patients. I would have proposed a recce of the type: in the event of legal proceedings, it is recommended to accompany the patient suffering from NSV

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Proposal 57 Is
the presentation of the recommendations clear and adapted to professional practices? (If not, propose a more suitable wording)

Missing values: 0

Quote value	Wording
1	Yes
2	No

Distribution of responses by number rating

Rating scale	1	2
Number of responses	36	1

Expert	Comments
Expert 5	Some proposals leave the field open to aggressive turbinectomy after unsuccessful local treatments. We should be clearer on that. The surgery must be measured and progressive, step by step so as never to place the patient in a situation of no return.
Expert 13	However: For practice in the office: need for names of sulfur specialties or nasal lubricants. What scores for the psy assessment?
Expert 15	prevention of risks and documents indicating the existing risks after the operation signed by the patient
Expert 25	However, the subject being dense, shorter sentences would improve the readability of the document and facilitate its understanding, which, in fact, would make these recommendations more easily applicable.

Proposal 58 Do
you have any general comments to make on the text of the recommendations?

Missing values: 0

Quote value	Wording
1	Yes
2	No

Distribution of responses by number rating

Rating scale	1	2
Number of responses	6	31

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Expert	Comments
Expert 5	There is no recommendation to encourage doctors to prescribe a PPP humidifier device to their patient to try at least to be better in sleep. There is also no proposal for reimbursement for an acellular dermis-type reconstructive operation in the USA. Maybe it's not within the jurisdiction of the HAS.
Expert 8	At no time does the word "iatrogenic" appear to characterize the VNS in the text of the recommendations, even though it is by definition an iatrogenic disease.
Expert 14	Regarding the psychiatric assessment: I agree with the need to offer the patient an assessment and management of the psychological burden related to the NS. Perhaps we could in 1st intention propose a psychological evaluation by a clinical psychologist and secondarily address the patient in psychiatry. already expressed It is important that the SNV due to procedures on the middle turbinates be
Expert 15	taken into
Expert 16	account in the recommendations.
Expert 24	It is necessary to create structures / train doctors or paramedics / establish networks, and this in various places of the territory to effectively take care of patients with snv. It is also necessary to intensify medical research on the snv and why not ask for a budget from the State because in the meantime lives are wasted or even lost! It's urgent!
Expert 28	Page 9, line 33: "The SNV has long been (instead of "was")
Expert 35	see my attached document

Proposal 59

Would other information be useful? (If yes, specify which ones)

Missing values: 0

Quote value	Wording
1	Yes
2	No

Distribution of responses by number rating

Rating scale	1	2
Number of responses	5	32

Expert	Comments
Expert 15	follow-up by the surgeon for several years of operated patients

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	the surgeon when I woke up told me it's no longer worth coming to see me I can't do anything more for you, I went back to see her because of my genes (I didn't know what SNV was at that moment) and told me that everything was fine it's not because I have a pimple on my arm that I have cancer a total denial and an even more blatant contempt for this person Spread life better than
Expert 19	they lead the victims of the SNV.
Expert 24	The essential point is to inform each patient before any surgical procedure on the turbinates (including laser, radiofrequency, etc... and including for outpatient procedures) by providing him with an information sheet mentioning the course of the procedure and ESPECIALLY the risks and/or complications (including snv) even if these are negligible or rare or exceptional. Because otherwise, I don't call it informed consent. Do ENTs who perform turbinate procedures on an outpatient basis currently systematically provide patients with an information document with the possible risks? I do not think so! However, it should be MANDATORY.
Expert 35	List of SNV associations SNV doctors etc.
Expert 36	A few questions about the sense of smell about possible olfactory distortions: Do you smell everyday smells less well? Do you smell unpleasant or distorted odors? loss of appetite

Proposal 60

Should annexes be attached? (If yes, specify which ones)

Missing values: 0

Quote value	Wording
1	Yes
2	No

Distribution of responses by number rating

Rating scale	1	2
Number of responses	11	26

Expert	Comments
Expert 3	SNOT-22 ENS-6Q NIJMEGEN score
Expert 5	Relevant medical literature could be appended, as well as the SCORE patient questionnaire

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Expert 13	Any quoted score must be present in the SNOT 22
Expert 14	Questionnaire Appendices
Expert 15	perhaps
Expert 18	the self-questionnaires cited, including snot
Expert 24	22. The contact details of the snv France association and possibly other suitable structures (if any) should be appended.
Expert 26	The specific quality of life questionnaires for nasal obstruction validated in French, the Nijmejen hyperventilation screening questionnaire studies, photos,... the quality of life
Expert 30	questionnaires and
Expert 34	others presented in the text of the validated questionnaires of psychiatric assessment, HAD, Pichot depression, sleep diary Appendices of clinical scores because not always easy to find
Expert 37	on the Internet

Proposition 61
Do you have any other comments?

Missing values: 1

Quote value	Wording
1	Yes
2	No

Distribution of responses by number rating

Rating scale	1	2
Number of responses	7	29

Expert	Comments
Specialist 1	I have taken the liberty of sending you the scientific argument and the text of the recommendations with the misprints noted in the comments. Thank you for this excellent rendering and for your trust.
Specialist 2	Pain management should be improved in pain centers or with the help of neurologists. The establishment of occasional oxygen therapy for a few minutes should be possible (if supported) since the nerves are damaged. It is already used for other pathologies (headaches, neuralgia) Night devices suitable for NS with humidifiers should be tried to improve sleep quality and fatigue. we're not crazy....it's not just in our head
Expert 15	
Expert 20	I underwent two turbinectomies, then cauterization in 1993 (removal of all of my lower turbinates and my right middle turbinate). I did not suffer from any pathology of the nose then, but only from a persistent cough.

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	resulting from pneumonia. At that time, no preoperative information on the justification of these surgeries, nor postoperative report were provided. I then lived more than 20 years of medical wandering to find out the cause of the many symptoms that occurred almost immediately after these operations. I was forced to stop my professional activity. I was then declared a disabled adult + 50 to 79%. I am absolutely against the invocation of depression and psychiatry. The symptoms are real.
Expert 24	Physicians, and more particularly ENT physicians, should recognize snv more easily, especially when patients come with related symptoms following an operation on the turbinates. So we need more listening and consideration from doctors orl. It would also be necessary that the snv be recognized by the health insurance, and therefore, that all costs relating to this disease be fully covered by social security. The snv should be part of the exonerating ALD (long-term illness). In addition, a status "disability snv" should be created because this disease makes people disabled. Thus, this would make the process perhaps a little simpler for those who want to obtain aid or allowances. So overall, we need better recognition of the snv at all levels and by all stakeholders, as well as better patient care, and also full coverage of the medical costs related to this pathology.
Expert 32	These recommendations supplement the formalized consensus of the SF ORL written in 2012 and which has been widely disseminated by contributing to better attention paid to surgery of the inferior turbinates. It also seems that the number of cases of SNV is constantly decreasing .... (AE!) see
Expert 35	attachment
Expert 36	In my practice, I find adult patients with sensations of nasal obstruction, secretory changes no anosmia rather hyposmia, but no , smell disorders but diagnosis of VNS. These patients consult after ENT, maxillofacial surgery and/or orthodontic treatment for OSAHS. They all present functional disorders of the oro-facial sphere: day and night mouth ventilation labial incompetence poor resting lingual position (key organ) dysfunctional swallowing anteriorization on certain phonemes proprioceptive dysfunctions

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Proposal 62 In the end, should these recommendations be adopted?

Missing values: 1

Quote value	Wording
1	Yes
2	No

Distribution of responses by number rating

Rating scale	1	2
Number of responses	35	1

Expert	Comments
Expert 5	Subject to my reservations of course and to the proposals for which my rating is less than 5 Even without taking into account my reservations, on the whole, it is in the common sense.
Expert 9	yes, but with a modification of the time of onset of the VNS in relation to the date of intervention. The risk, in the event of too long a delay, is to integrate patients who are not affected by the empty nose syndrome, but by an evolution of their nasal disease, with possible extra-nasal disorders related to the poorly tolerated chronicization of disease. but taking into account the studies
Expert 11	which highlight declared SNV after interventions on the middle and upper turbinates.
Expert 12	taking into account my remarks (snv on average cones) yes
Expert 15	prevention
Expert 19	With some modifications (SNV on hub cones)
Expert 24	Yes on condition of taking into account the comments of all the participants and especially of those who are sick of the snv and who therefore speak with knowledge of cause.
Expert 25	As far as I am concerned, this has the merit of making me aware of the SNV and of looking, a posteriori, at least several patients, differently, with avenues for dialogue and action for the most
Expert 27	part see proposed corrections
Expert 29	Taking into account the remarks, thank
Expert 31	you, funny question...isn't that the subject of the point-by-point proofreading by the designated group? see based on answers (but few edits suggested from my side)
Expert 32	by limiting their distribution to the last two target populations listed P 4 of the recommendations and the argument

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HAUTE AUTORITÉ DE SANTÉ

CNP-ORL
Conseil National Professionnel d'ORL et CCF

MEDICAL INFORMATION BEFORE PERFORMING TURBINOPLASTY IN ADULTS

Dear,

Turbinoplasty is the partial surgical removal of the lower turbinate(s) of the nose.

In order for you to be clearly informed of the progress of this intervention, we
please read this document carefully
of information. Your surgeon is at your disposal to answer all your questions.

Don't forget to tell your surgeon about the treatments you take regularly, and in particular Aspirin, anticoagulants... Don't forget to tell your surgeon if you have already presented allergic manifestations, in particular drug-related. Finally, do not forget to bring the medical documents in your possession during hospitalization: blood tests, radiological examinations in particular.

PURPOSE OF THE INTERVENTION

You have nasal obstruction linked to an increase in volume of the inferior turbinates. The failure of medical and local treatments leads to this intervention being offered to you.
The intervention aims to improve nasal ventilation by preserving the functions of the nasal mucosa as much as possible while preserving at least 2/3 of the turbinal structure.
The turbinates have a major role in nasal respiratory functions, heating and humidification of inspired air, barrier against airborne contaminants. They are also involved in the control of breathing and in the feeling of nasal respiratory comfort. This intervention has no effect on the flow
nasal passage, nor on sneezing.

REALIZATION OF THE INTERVENTION

The operation can be performed under local or general anesthesia. It is the competence of the anesthesiologist-resuscitator, whom you will see in consultation prior to the intervention, to answer your questions relating to his specialty.

The intervention is carried out without external scar, by the interior of the nose. Post-operative packing is sometimes useful to prevent bleeding.

The duration of hospitalization and post-operative care will be specified to you by your surgeon (in particular washing of the nasal cavities to remove crusts secondary to the healing process).

IMMEDIATE RISKS

Hemorrhage may occur.

SECONDARY RISKS

The formation of crusts is usual after the intervention, responsible for a feeling of dry nose.
It requires prolonged local care.

Residual nasal obstruction is possible.

Tearing, linked to irritation of the tear ducts, may exist for some time.

SERIOUS AND/OR EXCEPTIONAL COMPLICATIONS

Any medical act, investigation, exploration, intervention on the human body, even carried out under conditions of competence and safety in accordance with current scientific data and the regulations in force, harbors a risk of complication.

Empty nose syndrome (VSS) is a serious complication that can occur more or less shortly after a turbinal reduction procedure. It is characterized by the appearance of a paradoxical nasal obstruction and a host of other nasal symptoms (dryness, crusts, hypersensitivity to cold, to dry air, pain, purulent posterior rhinorrhea, gastrointestinal disturbances, smell and/or taste, etc.), and extra-nasal (dyspnea, sleep disorders, attention disorders, anxiety disorders, depressive disorders, headaches, pharyngeal dryness, etc.).
The incidence of SNV remains unknown.

Significant nasal bleeding is exceptional.

IN CASE OF SYMPTOMATIC FAILURE OF THE FIRST TURBINOPLASTY

In order to remove a residual nasal obstruction, you may be offered another turbinoplasty. This must retain at least 2/3 of the pre-existing turbine structure at the first intervention.

This document was developed based on the
recommendation **"Prevention, diagnosis and management of empty nose syndrome - November 2022".**

All our publications can be downloaded from www.has-sante.fr

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HAUTE AUTORITÉ DE SANTÉ

RECOMMEND
GOOD PRACTICES

ARGUMENT

Prevention, diagnosis and management of empty nose syndrome

Validated by the College on November 17, 2022

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Recommendations for good practice (GPR) are defined in the field of health as proposals developed methodically to help the practitioner and the patient to seek the most appropriate care in given clinical circumstances.

RBPs are rigorous summaries of the state of the art and scientific data at a given time, described in the scientific argument. They do not exempt the healthcare professional from exercising discernment in his treatment of the patient, which must be that which he considers most appropriate, according to his own findings and the patient's preferences.

This good practice recommendation was drawn up according to the method summarized in the scientific arguments and described in the HAS methodological guide available on its website: Development of good practice recommendations – Method Recommendations for clinical practice.

The objectives of this recommendation, the population and the professionals concerned by its implementation are briefly presented on the last page (descriptive sheet) and detailed in the scientific argument.

The latter as well as the summary of the recommendation can be downloaded from www.has-sante.fr.

Grade of Recommendations

AT	**Established scientific evidence** Based on studies with a high level of evidence (level of evidence 1): high-powered randomized controlled trials without major bias or meta-analysis of randomized controlled trials, decision analysis based on well-conducted studies.
B	**Scientific presumption** Based on scientific presumption provided by studies with an intermediate level of evidence (level of evidence 2), such as low-powered randomized controlled trials, well-conducted non-randomized comparative studies, cohort studies.
VS	**Low level of evidence** Based on studies with a lower level of evidence, such as case-control studies (level of evidence 3), retrospective studies, case series, comparative studies with significant biases (level of evidence 4).
EA	**Expert agreement** In the absence of studies, the recommendations are based on an agreement between the experts of the working group, after consultation with the reading group. The absence of gradation does not mean that the recommendations are not relevant and useful. It should, on the other hand, encourage the undertaking of additional studies.

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Description of the publication

Title	**Prevention, diagnosis and management of empty nose syndrome**
Method of working	Recommendation for clinical practice.
Goals)	Prevent empty nose syndrome (VSS). Diagnose and manage patients who develop VS.
Targets concerned	Patients for whom turbinate surgery is proposed. Patients who have undergone such surgery and have developed VNS. Professionals performing such surgical interventions and more broadly all those involved in the prevention, diagnosis, monitoring and management of patients with NSV.
Applicant	Empty Nose Syndrome Association France and French Federation of Associations and Friends of the Sick, Insufficient or Respiratory Handicapped.
Promoter(s)	High Authority for Health (HAS).
Project management	Coordination: Cédric Paindavoine, project manager, HAS good practices department (head of department: Doctor Pierre Gabach). Secretariat: Ms. Jessica Layouni.
Literature search	From January 2000 to May 2022 (cf. documentary research strategy described in appendix 1 of the scientific argument). Produced by Mrs. Marie Georget, with the help of Mrs. Yasmine Lombry and Mrs. Juliette Chazareng (head of the documentation department – monitoring: Mrs. Frédérique Pagès).
Authors	Dr Julie Fernandez Rodriguez, otolaryngologist and cervico-facial surgeon, Marseille – project manager.
Conflicts of interest	The members of the working group communicated their public declarations of interest to HAS. They can be consulted on the website https://dpi.sante.gouv.fr. They were analyzed according to the analysis grid of the HAS guide to declarations of interest and management of conflicts of interest. The interests declared by the members of the working group were considered to be compatible with their participation in this work.
Validation	November 17, 2022 version
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Preamble

This recommendation of good practice is part of the care pathway for patients with chronic nasal obstruction or who have developed VNS after a turbinal procedure. It is intended for professionals involved in the prevention, diagnosis, monitoring and management of these patients and is part of a multidisciplinary consultation involving the general practitioner and a decision shared with the patient.

Referral

The Empty Nose Syndrome France Association sent a referral to the HAS relating to the syndrome of the same name, relayed by the French Federation of Associations and Friends of the Sick, Insufficient or Respiratory Disabled (FFAAIR).

Among the numerous requests made in this referral, which do not all fall within the scope of HAS missions, is the "scientific evaluation of the indications for the technique of ablation and/or reduction of the turbinates, of the determinants of the empty nose syndrome and currently available treatments for SNV".

HAS included in its work program the development of a recommendation for good practice and invited the applicant and the National Professional Council for Otorhinolaryngology and Cer vico-facial Surgery in order to define the topic. These concerted stakeholders retained the title: "Prevention, diagnosis and management of empty nose syndrome in the event of surgery for nasal obstruction". The working group subsequently wished to modify the title, which then became "Prevention, diagnosis and management of empty nose syndrome".

Context

Empty nose syndrome (VSS) is a complication of turbinate reduction surgery performed as a last resort in cases of nasal obstruction, allergic rhinitis, etc. It is in practice a procession of nasal and extranasal symptoms (and not a disease) occurring within a variable period (days to years) after turbinal surgery.

In the absence of a reliable epidemiological study, the incidence is poorly known.

On the physiopathological level, the VNS results in sensations of paradoxical nasal obstruction, loss of humidification functions and heating of the inspired air; loss of sensory receptors but retained menthol sensitivity; increase and modification of airflow speed; disturbances in ventilatory control; neuropsychic factors.

The SNV also results in extranasal signs: dyspnoea/hyperventilation; headaches; fatigue/difficulty concentrating; sleeping troubles ; anxiety/mood disorders.

The SNV can have psychological repercussions: depression, major desocialization, agora phobia, job loss and sometimes even damage to physical integrity.

Questions come up regularly and remain unanswered:

- ÿ Why do some patients who have undergone total ablation of the inferior turbinates for a patho tumor logy not develop VNS?
- ÿ Could simple cauterization of the inferior turbinates (the least invasive procedure possible) cause VS in some patients?

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- Why has SNV been described for 15-20 years while turbinate surgery is much more Ancient ?

There is a deficit of knowledge and recognition on the subject, and the impact on the quality of life of the patients concerned is major, but advances exist (study on dyspnea invoking hyperventilation, work on the flow of fluids by a team from Marseille, etc.).

In any case, the emphasis should be on informing the patient.

Goals

This recommendation for good practice aims on the one hand to prevent VNS, and on the other hand to diagnose and manage patients who develop VNS.

The purpose is to improve the care of patients and therefore the quality and safety of the care provided to them, as well as their quality of life, by helping decision-making in the choice of care and by allowing the professionals concerned improve and harmonize their practices.

Targets concerned

This good practice guideline concerns patients to whom surgery on the turbinates is proposed, as well as those who have developed VS after having undergone such surgery.

This recommendation of good practice is intended for professionals performing such surgical interventions likely to be the cause of VNS and more broadly for all those involved in the prevention, diagnosis, follow-up and management of patients. affected by NSV.

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1. General

1.1. Historical

Turbinate volume reduction surgeries have been common in ENT surgery since the late 1800s (1). The total turbinectomy procedure, which was performed systematically before, was then abandoned, due to the occurrence of complications such as bleeding, scabs, secondary atrophic rhinitis or disruption of nasal ventilation, in favor of new, more conservative techniques (1, 2). In the 1970s and 1980s, total turbinectomy experienced a revival, due to a very high success rate reported in the literature, between 63 and 94% (2).

Moore and Kern's work in 2001 first showed a supposed link between turbinate surgery and atrophic rhinitis. They published a retrospective study of 242 patients diagnosed with atrophic rhinitis between 1982 and 1999. Among them, 157 had a history of turbinectomy including 110 partial (lower and/or middle) and 47 total (3) . At the same time, other authors also reported the occurrence of secondary atrophic rhinitis after turbinectomy, in an estimated proportion of between 15 and 71% of cases. On the other hand, others report never having encountered the slightest case of atrophic rhinitis or “empty nose” after performing total lower turbinectomies (3).

The term “empty nose syndrome” (VSS) was first used in 1994 by Kern and Stenkvist to describe areas of surgical vacuity in the region of the inferior and middle turbinates on CT scans of patients who had undergone inferior turbinectomies or medium (2, 4). These patients seemed to suffer more frequently from nasal dryness and crusting. Despite an aspect of endonasal vacuity, these patients complained on the contrary of a sensation of nasal obstruction, then called “paradoxical”.

Instigated by the American Society of Rhinology, a consensus conference was organized during the *Combined Otolaryngological Spring Meetings* in 2001, the reflection on the problem of surgery of the middle and inferior turbinates. Experts have recognized that excessive resection of turbinal tissue can lead to the occurrence of VS (5).

In France, a formalized consensus of the French Society of Otolaryngology and Surgery of the Face and Neck (SFORL) dating from 2012 recognizes the existence of SNV and outlines its clinical and physiopathological contours (6). Recommendation no. 2 defines VNS as follows: “Empty nose syndrome combines a sensation of nasal obstruction, secretory changes and disturbances of smell triggered by turbinal reduction surgery” (strong agreement).

NSV has long been defined as a secondary form of atrophic rhinitis (2, 3), but some authors believe that they are two distinct pathologies (7, 8). For Chhabra and Houser, while SNV and atrophic rhinitis have common symptoms, the loss of turbinal substance in atrophic rhinitis reflects the underlying pathology, atrophic rhinitis can occur after turbinectomy, but can also be secondary to trauma, pathology infectious or autoimmune. VNS, on the other hand, is a purely iatrogenic condition: in all cases of VNS, patients have a history of turbinal surgery (7).

Houser proposed a classification of SNV into four groups based on tissue resection. ENS-IT patients are those who have undergone partial or total amputation of the inferior turbinates. ENS-MT patients are those who have undergone partial or total amputation of the middle turbinates. In ENS-Both patients, the inferior and middle turbinates were completely or partially resected.

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Finally, Houser recognizes a fourth group, ENS-type patients, in whom there is no visualized loss of turbinal tissue, who present with NSV symptomatology, who have a history of turbinal surgery, and whose symptomatology improves. with the cotton test (7-9).

For Payne, on the other hand, to broaden the definition of VNS in this way to include patients in whom no turbinal structure is missing is a misappropriation of the term “empty nose syndrome”.
He himself proposes to define the VNS as a complex symptomatology including, at the very least, the sensation of paradoxical nasal obstruction, associated with a turbinal resection, complete or partial (10).

The definition of the SNV is, to date, not consensual. SNV remains a rare pathology. Additionally, some patients will not develop SNV after radical amputation of the turbinate structures, while others will develop SNV after partial resection. For these reasons, some practitioners have long doubted the very existence of the SNV (9).

1.2. Impact

The exact incidence of empty nose syndrome is not known, as no large-scale studies have been conducted to estimate the incidence of VS after turbinal surgery (11).

Nevertheless, some authors have advanced to give an estimate of the latter.

According to Chaabra and Houser, about 20% of patients will develop VNS after turbinal resection, and a larger proportion of patients will suffer from at least nasal dryness (7).

Other authors report the occurrence of secondary atrophic rhinitis after turbinectomy, in an estimated proportion of between 15 and 71% of cases (3).

Conversely, as other authors have pointed out in their reviews of the literature, there are also large series with long-term follow-up which do not report any case of secondary atrophic rhinitis occurring after total or subtotal turbinectomies. (10-12). The authors nevertheless emphasize the fact that in these studies, up to 6% of patients had no improvement in their nasal ventilation despite a reduced turbinal volume (12).

For Payne, patients with allergic rhinitis or chronic rhinosinusitis may be less likely to develop certain symptoms due to the persistence of hypertrophy of the remaining nasal mucosa, even after turbinal resection (10).

According to recommendation no. 4 of the 2012 formalized SFORL consensus, "empty nose syndrome is an exceptional complication of turbinal surgery (in view of the number of procedures) which must nevertheless always be taken into account" (agreement strong) (6).

Given the very high frequency of chronic nasal obstruction (estimated at one third of the population (13)) and, consequently, the high frequency of turbinal gestures performed to relieve it, it is reasonable to estimate that the SNV remains a rare complication of turbinal surgery.

1.3. Time to onset

In the same way, the delay in the appearance of symptoms after a turbinal procedure remains poorly understood.

For some, the signs may be early. In a 2019 retrospective study of 27 SNV subjects, Malik *et al.* reported that VS symptoms appeared within one month after turbinal surgery for 20 of 27 patients (14).

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Other authors report later symptoms, ranging from several months to several years after turbinal surgery (4, 7).

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2. Pathophysiology

2.1. Pathophysiological mechanisms of the VNS: hypotheses

2.1.1. At the nasal level

2.1.1.1. Sensors

An alteration in the function of the trigeminal nerve is mentioned by some authors. The perception of the vacuity of the nasal fossae would be linked to the activation of the trigeminal nerve during inspiration of cold air, possibly mediated by TRPM8 channels (thermoreceptor-like *transient receptor potential channel melastatin* 8) located in the nasal epithelium . The application of menthol in the nasal fossae would be responsible for a sensation of nasal decongestion, without modifying the endonasal anatomy, by activating these TRPM8 channels (15). Li *et al.* compared the detection threshold for lateralization of inspired menthol in 6 SNV patients and 22 healthy subjects. The subjects had to breathe simultaneously into two bottles (connected separately to both nostrils), one containing menthol in decreasing concentrations (from stage 1 where the solution is the most concentrated, to stage 20 where the solution is the more diluted), the other containing only odorless mineral oil. The menthol dilution threshold at which the subjects managed to correctly lateralize inspired menthol was sought. The authors observed that SNV subjects had a significantly lower detection threshold for inspired menthol lateralization than healthy subjects (9.2 ± 4.6 *versus* 14.8 ± 1.6 [expressed in dilution steps] , t = 3.78, $p < 0.005$). The experiment was then repeated on 27 SNV patients compared to 42 healthy subjects, with comparable results: lower detection thresholds in SNV subjects (10.3 ± 3.9) than in healthy subjects (14.0 ± 1.8, $p<0.0001$). The authors concluded that SNV subjects had impaired trigeminal nerve function compared to healthy subjects (15, 16).

Malik *et al.* applied the same evaluation protocol to 12 SNV subjects compared with 20 healthy subjects and 5 subjects with "aggressive" turbinectomy sequelae without SNV symptoms. They observed that SNV subjects had significantly lower inspired menthol lateralization detection thresholds than healthy subjects (10.2 ± 3.87 *versus* 14.8 ± 1.59, $p < 0.0001$) and also lower than subjects with “aggressive” turbinectomy sequelae without SNV symptoms (10.2 ± 3.87 *versus* 15.2 ± 1.23 $p < 0.0001$). Subjects with “aggressive” turbinectomy sequelae without VNS symptoms had a slightly higher detection threshold than healthy subjects, significantly ($p < 0.05$) (14).

Konstantinidis *et al.* found similar results. The lateralization detection threshold of the menthol was significantly lower in SNV subjects (21.8 ± 3.5, n = 21 patients) than in subjects with sequelae of subtotal turbinectomies without SNV symptoms (29.8 ± 3.2, $p = 0.021$, n = 18 patients) and healthy subjects (34.5 ± 3.5, $p = 0.004$, n = 32 patients). On the other hand, they did not find any significant difference between the subjects having sequelae of subtotal turbinectomies without symptomatology of VNS and the healthy subjects ($p = 0.067$) (17).

Wu *et al.* highlighted specific abnormalities of the mucosa of patients with VS. The anatomopathological characteristics of the mucosa of the inferior turbinates of 17 SNV patients were studied and compared with 6 control subjects. Compared to the control group, SNV patients had more squamous metaplasia, more submucosal fibrosis, and a significantly lower number of submucosal glands, changes that the authors compare to those observed in atrophic rhinitis. Without being statistically significant, goblet cell metaplasia was observed in 6 SNV patients, absent in healthy subjects.

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On the other hand, the epithelial layer of the SNV subjects was almost intact, with preservation of the ciliated and goblet cells, with no statistically significant difference in the number of cells between the two groups. In immunohistochemistry, the expression of TRPM8 was significantly lower in the SNV group than in the control group. This decrease in their expression could explain the dysfunction of the trigeminal nerve and the loss of sensation of the passage of air and of permeability of the nasal cavities observed in the SNV (18).

For Sozansky and Houser, interindividual differences in postoperative nerve recovery could explain why some patients develop VNS and others do not, for identical surgeries (4).

2.1.1.2. Conditioning fault

In numerical simulation of flows, Naftali *et al.* estimated that the middle and inferior turbinates are responsible for 70% of the air conditioning capacity of the nasal cavities, and that amputation of the turbinal structures reduces the effectiveness of air conditioning in the nasal cavities by nearly 30% (19).

Temperature

A drop in temperature in the nasal cavities is strongly suspected to play a role in VNS. Tsakiropoulou *et al.* performed *in vivo* measurements of temperature and humidity in the nasal cavities of 57 subjects with a history of partial inferior turbinectomy. Note that none of these subjects had SNV. They were compared with 28 healthy subjects. Temperature and humidity measurements were taken at the level of the head of the inferior turbinate and the head of the middle turbinate, in the two nasal cavities. The air temperature at the two detection sites was signifi cantly lower in the post-turbinectomy group than in the control subjects: - 13% at the head of the inferior turbinate and - 19% at the head of the middle turbinate. On the other hand, no statistically significant difference was observed for humidity values (20).

Numerical flow simulation studies *(computational fluid dynamics)* have also found lower temperatures in the nasal cavities after turbinectomies. Dayal *et al.* found that the ability to warm and moisten the nasal mucosa, close to 100% preoperatively, was only 60 to 80% after lower turbinectomy (21). Balakin conducted a numerical simulation study of flows on pre- and post-operative CT scans of an SNV patient after bilateral partial lower turbinectomy. After turbinectomy, he observed an increase in velocity and a decrease in temperature, the inspired air having to travel a greater distance in the nasal cavities to be warmed (22).

Speed

In numerical simulation of flows, after average turbinectomy, Di *et al.* observed an increase in air velocity during inspiration and expiration in the postero-superior part of the nasal cavity, in the region of the sphenopalatine ganglion, which was not observed after inferior turbinectomy . Since pain or headache seemed to be more frequently reported by SNV patients after middle turbinectomy than after inferior turbinectomy, Di *et al.* hypothesized that this is due to stimulation of the sphenopalatine ganglion by greater air velocity. They also observed a decrease in air velocity in the lower corridor after turbinectomy.

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inferior, which, for them, would explain the paradoxical obstruction, by reduction of the stimulation of the mechanoreceptors of the nasal mucosa which take part in the sensation of the passage of the air (23).

Heat transfer

Zhao *et al.* tried to identify the physical and physiological factors contributing to the sensation of nasal cavity patency. Forty-four healthy volunteers had to breathe ambient air, dry air and cold air. Their feeling of permeability of the nasal cavities was assessed by self-measurement on a visual analogue scale. The temperature and humidity of the inspired air were collected. Cold inspired air was correlated with a better feeling of permeability of the dirty nasal fossae. At constant temperature, variation in humidity significantly influenced the sensation of nasal permeability. For the authors, this demonstrates that it is the cooling of the mucous membrane (or heat transfer) which is involved in the sensation of permeability of the nasal cavities, this heat transfer taking place by evaporation of the water present in the inspired air associated with the thermal conduction generated by the temperature gradient (24).

In numerical simulation of flows, Sullivan *et al.* observed that the increase in heat transfer from the air to the nasal mucosa was correlated with the improvement in the sensation of permeability of the nasal cavities of patients postoperatively after functional endoscopic surgery performed for nasal obstruction. Indeed, a low NOSE score was significantly correlated with the amount of nasal mucosal surface area stimulated by heat transfer > 50 W/m² (25).

For Dayal *et al.,* despite an increase in nasal airflow, the mucosal surface area where heat transfer exceeds 50 W/m2 decreases after total inferior turbinectomy. Receptors sensitive to mucosal cooling *(mucosal cooling effect)* would be less stimulated, potentially contributing to the sensation of paradoxical nasal obstruction (21).

Humidity

In their digital flow simulation study on pre- and post-operative CT scans of an SNV patient after bilateral partial inferior turbinectomy, Balakin *et al.* observed that after turbinectomy, the inspired air was drier than before surgery, which they explained by a greater speed of the air flow leading to a shorter contact time with the mucous membrane of the nasal fossae and therefore less humidification (22).

Wall Shear Stress

A decrease in shear stress *(Wall Shear Stress* – WSS) in areas of surgical vacuity in SNV patients is consistently found in numerical flow simulation studies (14-16, 23, 26-28).

2.1.1.3. Flow disturbances

Vortex

In numerical simulation of flows, several studies have found the formation of vortices (or whirlpools) in the lower corridors in patients with VNS, or after virtual surgery simulating a total lower turbinectomy (23, 27). The authors hypothesize that these vortices

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lead to drying of the nasal mucosa, generating crusts, very frequently observed in the SNV.

Change in respiratory flow distribution

Numerical flow simulation work consistently finds a change in the distribution of inspiratory flow in the SNV or after radical inferior turbinectomy in virtual surgery. The results are however discordant according to the teams.

In virtual surgery, after lower turbinectomy, authors have observed an increase in air flow in the lower corridors, to the detriment of the middle and upper corridors. The streamlines that materialize the inspired air are mainly directed towards the lower corridor, and a smaller proportion reaches the olfactory cleft, compared to the models of healthy subjects (21, 23, 27, 28). This limitation of flow in the olfactory cleft would be responsible, according to the authors, for the anosmia or hyposmia found in the SNV. These aerodynamic changes are greater after inferior turbinectomy than after middle turbinectomy (21, 23). For the authors, this is to be correlated with the fact that NS symptoms such as nasal dryness, crusts, paradoxical nasal obstruction, hyposmia or anosmia, are more frequently observed in patients after inferior turbinectomy than after middle turbinectomy (23) .

Li *et al.* observed the opposite effect. Their team studied the largest cohort of SNV subjects in digital flow simulation, comparing 27 SNV patients with 42 healthy subjects. In this study, SNV subjects had significantly reduced airflow in the lower aisles and increased airflow in the middle aisles. The streamlines were narrowly concentrated in the middle corridor, to the detriment of the lower corridors, whereas in healthy subjects the streamlines were harmoniously distributed between the lower and middle corridors (16). Li *et al.* highlighted the fact that, in this cohort of 27 SNV patients, only 4 patients had had a radical turbinectomy (2 lower turbinectomies and 2 middle turbinectomies). In contrast, all SNV subjects had undergone septoplasty, functional endoscopic surgery, or middle turbinate resection associated with inferior turbinate resection. For the authors, this association could aggravate the risk of occurrence of VNS (16). This work was continued by Malik *et al.* who compared these 27 SNV patients to 42 healthy subjects, but also 5 patients with a history of inferior turbinectomy without having developed SNV. They observed that in SNV patients, the inspired air did not take the lower corridor, unlike healthy subjects and subjects who had had a lower turbinectomy without having developed SNV (and this while widening of the necks lower dormouse after turbinectomy was as important as in SNV subjects) (14).

Maza *et al.* studied, by numerical simulation of flows, the occurrence of VNS after endoscopic surgery of the base of the skull. Four patients were included. These patients underwent endoscopic skull base surgery including upper and middle turbinectomy, posterior septectomy and wide sphenoidotomy. Their initial pathologies were a meningioma, an encephalocele and two pituitary adenomas. Two of these patients had postoperative VNS (defined by an ENS6Q score greater than 11), the other two had not. A numerical simulation study of the flows was carried out on the postoperative images of these patients (scanner and MRI). Two other groups of patients were used for comparison, a group of 27 subjects who developed VNS after endoscopic functional surgery and a group of 42 healthy subjects. The authors observed a significantly lower percentage of inspired air in the lower corridor in the two patients with VNS after endoscopic skull base surgery than in the two who did not.

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(17.74% ± 4.00% *vs* 51.25% ± 3.33%, p < 0.002). The streamlines revealed an alteration in the distribution of inspired air in the two SNV subjects after doscopic surgery of the base of the skull, similar to what was observed in the SNV subjects after functional surgery . endoscopic, namely a distribution mainly concerning the middle corridor, to the detriment of the lower corridor. On the other hand, the two subjects who had not developed VNS after endoscopic surgery of the base of the skull had a distribution of inspired air in the two lower and middle necks similar to what was observed in healthy subjects. The authors conclude that the alteration of the inspired air conditioning pattern appears similar in SNV subjects, regardless of the extent of the initial surgery (functional surgery or skull base surgery) (26).

2.1.2. At the cerebral level

Freund *et al.* compared the functional MRIs of 10 SNV subjects and 15 healthy subjects who had to assess their sensation of nasal permeability during free breathing, then during inhalation of menthol and limonene. SNV subjects showed specific activation of certain brain areas belonging to the limbic system, which was not found in control subjects. Since these same brain areas were also activated in an experiment studying a situation of respiratory stress, the authors concluded that a state of "respiratory stress" was observed in SNV patients.
Furthermore, the beneficial effect of menthol inhalation could correspond to the deactivation of the paralimbic areas, which is why the authors recommend including menthol in local treatments for VNS (29).

2.1.3. At the neuropsychiatric level: physiopathology of the disorder functional

In some patients, the empty nose syndrome is characterized by a set of painful and disabling symptoms, the intensity or impact of which cannot be explained, or insufficiently, by objectifiable ENT abnormalities.

Some of these symptoms could in this respect come under so-called "functional"(30) somatic disorders characterized by symptoms or complaints of a physical type, not attributable to a dysfunction or lesion of the organ designated by the symptoms, and to the origin of suffering or significant functional impact.

The pathophysiology of functional disorders is not specific to a particular symptom and involves cognitive and behavioral mechanisms.

Among the cognitive mechanisms, symptoms initially caused by a physical triggering factor (infection, surgical intervention, trauma, etc.) can give rise to a phenomenon of responsive conditioning of the brain (unconscious learning) resulting in the perpetuation of painful bodily sensations, including understood in the absence of the stimulus. Like any perception, bodily sensations depend on a balance between the new information provided by the peripheral nervous system and the old information stored in memory by the brain. An alteration of this balance in favor of old information can favor the emergence of bodily perceptions as well as their amplification by a lasting attentional focus.

Among the behavioral mechanisms, the painfulness of the symptoms can legitimately contribute to avoidance behaviors aimed at reducing their occurrence.

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These avoidance behaviors are at the origin of both physiological and psychological reinforcing mechanisms. For example, in the case of VS, avoidance of cold, dry air results in short-term symptom relief, but increases long-term sensitivity to dry air, to which the subject will be less and less tolerant.

Similarly, the avoidance of uncertainty leading to a search for reassurance through the multiplication of medical consultations, the repetition of additional examinations and/or the excessive search for information on the internet can reinforce intolerance to this same uncertainty. . These avoidance mechanisms contribute to the absence of extinction of the initial responsive conditioning and promote the excessive attention paid to bodily sensations, contributing in return to the maintenance and perpetuation of the functional disorder.

Of course, these cognitive and behavioral mechanisms can coexist with other pathophysiological mechanisms.

2.1.4. At low respiratory level

2.1.4.1. Decreased pulmonary resistance

Nasal resistance plays a major role in the opening of peripheral bronchioles and the optimization of alveolar ventilation (31). They are half the resistance of the entire airway, and 50% more effort is required to breathe through the nose rather than the mouth (3, 8). A significant decrease in nasal resistance, as observed in VNS, could compromise the state of equilibrium of respiratory pressures, explaining the sensations of dyspnea and not being able to breathe satisfactorily reported frequently in VNS (8).

2.1.4.2. Hyperventilation syndrome

Mangin *et al.* diagnosed a hyperventilation syndrome (HVS) associated with SNV in 77% of cases (17 patients out of the 22 SNV patients included). Five SNV patients with HVS benefited from a respiratory rehabilitation program. Their SNOT-16 score was significantly lower after rehabilitation (27.6 ± 4.1 *versus* 20.4 ± 2.3, p = 0.02). For the authors, the link between the two syndromes could be explained by a common psychological ground and an alteration of pulmonary functions secondary to the lack of air conditioning observed in the SNV. Systematic screening for HSV is necessary. Pulmonary rehabilitation appears to be a useful therapeutic approach in SNV patients (32).

2.1.4.3. Nasal nitric oxide (nNO)

nNO is synthesized by the mucosa of the nasal cavities and sinuses. A collapsed nNO level is a marker used in the diagnosis of primary ciliary dyskinesias (33, 34).

Fu *et al.* studied the level of nNO in 19 patients with VNS, compared with 12 patients with chronic hypertrophic rhinitis. nNO levels were significantly lower in SNV subjects than in subjects with chronic hypertrophic rhinitis (85.5 ppb [5.5 – 333.0] *versus* 231.3 ppb [114.0 – 426.0], p<0.001). The authors also performed a measurement of nNO in healthy subjects with an average of 396.2 ppb ± 125. SNV subjects benefited

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then an endonasal microplasty. The postoperative nNO level at 3, 6 and 12 months was signifi cantly increased (p = 0.015) (33).

2.2. Etiologies of VNS

2.2.1. Inferior turbinectomy – inferior turbinoplasty

The authors agree that while the majority of SNV cases occur after extensive surgery (total or subtotal inferior turbinectomies), the majority of patients undergoing tur binal surgery (including total turbinectomies) do not develop SNV. (4, 7, 9, 11, 31).

Some cases of VNS have however been described after a more conservative procedure (turbinoplasty), in a much lower proportion (4, 9). The latter correspond to the "ENS-type" case of the Houser classification (patients with a history of turbinal surgery without visualization of loss of turbinal tissue, presenting with SNV symptomatology improved with the cotton test) (7-9).

The following are found in particular in the cohorts reported in the literature :

- ÿ eight SNVs occurred after radical inferior turbinectomy and 16 SNVs after inferior turbinoplasty by microdebrider or coblation in the study by Kim *et al.* (35); ÿ ten SNVs occurred after bilateral total inferior turbinectomy, 3 SNVs after turbinoplasty and one SNV after reduction of the turbinal volume by radiofrequency in the study by Bastier *et al.* (36);
- ÿ fifty-four SNVs that occurred after partial or total lower turbinectomy in the study by Huang *et al.* (37); ÿ seventeen VNS occurring after partial or total lower turbinectomy in Jang's study *et al.* (38);
- ÿ twenty-four VNS occurring after partial or total inferior turbinectomy in the study of Jiang *et al.* (39);
- ÿ fourteen VNS in Le Bon's study, occurring after inferior turbinectomy (partial or total) or inferior turbinoplasty (bipolar, monopolar or radiofrequency cautery) (40);
- ÿ thirty SNV occurring after lower turbinectomy in the study by Lee (41); ÿ twenty-seven cases of SNV in the study by Li *et al.* including 2 after total lower turbinectomy and 25 after partial lower turbinectomy or submucosal resection (16);
- ÿ thirty-four cases of VNS occurring after partial or total lower turbinectomy in the study by Hong *et al.* (42); ÿ twenty-one cases of VNS occurring after subtotal inferior turbinectomy in the study by Kons tantidinis *et al.* (17); ÿ twenty-two cases of VNS including 3 cases occurring after turbinoplasty (one submucosal resection and two radiofrequencies), 18 cases after lower turbinectomy, and 1 case after lower and middle turbinectomy in the study by Mangin et al . (32).

Hong *et al.* attempted to assess the influence of the remaining volume of the inferior turbinates on the symptomatology of SNV patients. They compared the inferior turbinate volume of 34 SNV patients as well as 10 healthy subjects and investigated possible correlations between inferior turbinate volume and the SNOT-25 score. They did not find a clear correlation between the volume of the inferior turbinates and the

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total SNOT-25 score, but small turbinal volume was significantly correlated with some specific items of the SNOT-25 score such as nasal dryness, thick rhinorrhea and facial pain (42).

2.2.2. Medium Turbinectomy

SNVs appearing after middle turbinectomy are rarer than after inferior turbinectomy (9, 10).

The cohorts in the literature studying VNS occurring after middle turbinectomy are less numerous than those dealing with cases occurring after lower turbinectomy. Are found in particular :

- ÿ a series of 24 cases of VNS including 14 after a procedure involving the lower and middle turbinates and 3 after a procedure involving only the middle turbinates (43); ÿ twenty-seven cases of VNS after lower turbinectomy, of which 7 also had a history of associated medium turbinal surgery (16).

The occurrence of VNS after mid turbinectomy is still controversial (9, 10). Similar to inferior turbinectomies, the majority of medium turbinectomies do not result in the occurrence of VNS. In a 2014 literature review, Choby *et al.* analyzed the consequences of average turbinectomies performed during endoscopic surgeries for chronic rhino sinusitis. The authors did not find any harmful effect after middle turbinectomy compared with preservation of the middle turbinates, but this review is limited by the low level of evidence of the available studies (44). Tan *et al.* also studied the occurrence of VNS after medium turbinectomy in the context of the management of chronic rhinosinusitis, in a prospective study involving 177 patients. All patients underwent endoscopic surgery for chronic rhinosinusitis resistant to optimal medical treatment. For 93 of them, the middle turbinates were partially resected, and for the other 84 patients, the middle turbinates were preserved. The decision for partial resection of the middle turbinates was taken when they were lateralized (by the polyps themselves or due to an anatomical cause or synechiae). Only the upper third of the middle turbinates was then preserved. No movement was performed concomitantly on the inferior turbinates. No difference was noted in the results of the postoperative ENS6Q scores between the two groups of patients ($p = 0.7791$). An improvement in patient symptoms was noted in both groups (measured by the ADSS score), with no statistically significant difference. The authors concluded that partial resection of the middle turbinates could be performed without danger in endoscopic surgeries, particularly when there is a risk of lateralization of the middle turbinates (45). Similarly, Noel *et al.* found no cases of occurrence of VNS after medial maxillectomy (with inferior turbinal resection), in a retrospective study of 8 patients (46). Law *et al.* followed 95 patients treated for chronic rhino sinusitis or inverted papillomas of the frontal sinus, who underwent endoscopic sinus surgery (Draf IIB or Draf III) associated with bilateral total medium turbinectomy. Note that no surgery was performed on the inferior turbinates. In these patients, the postoperative ENS6Q SCORE was on average 2.1 ± 2.7 during the last postoperative follow-up consultation. 2.1% of patients had a postoperative ENS6Q ÿ 11, and 6.3% of patients had scabs at the last follow-up endoscopy. The authors specify that none of the patients who presented an ENS6Q score ÿ 11 presented scabs on endoscopy. The authors also specify that the two patients who presented an ENS6Q score ÿ 11 postoperatively were both suffering from chronic rhinosinusitis with polyps and had undergone type of surgery.

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Draf III, and explain their high ENS6Q score by the symptomatology linked to their pathology and not to an VS. For the authors, the occurrence of VNS after medium turbinectomy is unlikely, at least during the first postoperative year (47).

2.3. Contributing factors

There are no contributing factors known to date.

Manji *et al.* studied the impact of local climatic factors on the incidence and severity of NSV. Fifty-three SNV patients were included, spread over 5 continents, in 15 countries. The participants answered questionnaires relating to demographic, geographical and symptomatological indicators. A study of the correlations was carried out via the calculation of the Pearson coefficient. No significant association was found between the severity of NSV (assessed via the ENS6Q score) and the climatic parameters assessed (annual average: average temperature, high and low temperatures, relative humidity, morning and evening, dew point, days of precipitation, total precipitation, and pollution indices). The authors weight these results by a limitation of their study related to the geographic distribution of the cohort studied (half of the patients residing in North America due to a questionnaire available only in English) (48).

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3. Prevention

3.1. Compliance with surgical indications

Prevention is essential, because the therapeutic options once the SNV is installed remain limited to date. An exhaustive search for the presence of an allergy or other reversible factors leading to turbinal hypertrophy is necessary, possibly allowing appropriate medical treatment to be instituted and the need for inferior turbinate surgery to be postponed (49). In patients with lower turbinal hypertrophy in the setting of allergic rhinitis, the American Academy of ENT and Head and Neck Surgery issued a clinical practice guideline noting that "turbinal volume reduction surgery should be offered to patients patients with allergic rhinitis presenting with nasal obstruction due to turbinal hypertrophy in failure of medical treatment" (1).

For Scheitauer, surgical reduction of the inferior turbinates should only be indicated after three months of conservative treatment without obtaining any subjective or objective improvement (rhinomano metry, acoustic rhinometry). In case of associated subacute or chronic rhinosinusitis, this period of conservative treatment should be extended to six months (2).

According to the 2001 American Society of Rhinology Consensus Conference, subtotal or total midline turbinectomy may be indicated for patients with reversal of curvature of the middle turbinate, concha bullosa, or significant polyposis, including allergic fungal sinusitis (5). Simultaneous resection of both middle and inferior turbinates should not be performed for the management of a pathology that is not neoplasia (5).

3.2. Recommended techniques

All the authors agree to abandon radical techniques in favor of conservative techniques.

According to recommendation no. 10 of the 2012 formalized SFORL consensus: "For functional purposes, it is not recommended to remove the entire inferior turbinate" (strong agreement) (6).

Similarly, Gill *et al.* recommend preserving at least 50% of the volume of the inferior turbinates in the event of turbinal surgery (12). Bergmark also agrees that radical inferior turbinectomies should not be performed as part of the management of nasal obstruction, due to a low but not zero risk of developing VNS (1). For Scheitauer, due to the low efficacy of medical treatments in the SNV, minimally invasive surgery of the turbinates, preserving the nasal mucosa, remains one of the most important principles of naso-sinus surgery (2).

Kavin Kumar *et al.* conducted a randomized controlled trial comparing the effectiveness of inferior turbinoplasty and inferior partial turbinectomy in 60 patients with chronic hypertrophic rhinitis. SNOT-22 scores and the endoscopic aspect of the nasal cavities were assessed up to 6 months postoperatively. The authors observed a significant decrease in the postoperative SNOT-22 score in both groups, with greater clinical improvement after turbinoplasty than after turbinectomy ($p < 0.001$). Greater morbidity was observed after partial turbinectomy than after turbinoplasty (persistence of scabs and rhinorrhea in 13% of patients after partial turbinectomy, absent after turbinoplasty, during the evaluation at 6 months postoperatively). Finally, the authors reported that persistent postoperative nasal obstruction

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was statistically significantly more frequently observed after turbinectomy than after turbinoplasty (50).

Sinno *et al.* conducted a systematic review of the literature on inferior turbinate surgery. Fifty-eight articles published between 1980 and 2015 were selected. Regarding total turbinectomy, 7 studies were included, involving a total of 664 patients. An improvement in nasal obstruction was found in 79% of patients. The most frequently reported complications were scabs (21%) and postnasal drip (19%). Regarding partial turbinectomy, 12 studies involving a total of 1,136 patients were retained. An improvement or disappearance of the sensation of nasal obstruction was noted in 71.3% of patients. The most common complications were scabs (20%) and rhinorrhea (11%). Concerning the turbinoplasties, of all the techniques studied, electrocautery caused the highest percentage of patients suffering from crusts and posterior rhinorrhea. The techniques causing the least complications seemed to be cryotherapy, radiofrequency and laser. Although partial turbinectomies, total turbinectomies and laser can achieve lasting results, these techniques do not preserve the functionality of the mucosa. Restoration of mucociliary clearance and mucosal secretory function has only been proven in the submucosal resection technique. Radiofrequency would also allow the preservation of nasal function. In conclusion, the authors believe that the optimal treatment for inferior turbinate hypertrophy should provide long-lasting results, preserve turbinate function, and have a low complication rate, with submucosal resection and radiofrequency appearing to be the two techniques filling the gap. these criteria better (51).

The effectiveness of microdebrider and radiofrequency inferior turbinoplasty techniques was studied and compared in a meta-analysis by Acevedo *et al.* in 2012. There was no significant difference between the two techniques (52). Mirza *et al.* published in 2020 a meta-analysis of randomized trials also comparing these two techniques. The authors reported a significantly greater improvement in nasal obstruction after microdebrider than after radiofrequency (nasal obstruction assessed by a score of 0 to 10 on a visual analogue scale at 3-6 months, 1 year and 2 years). Rhinomanometry found no significant difference at 3-6 months, but a significant difference at 2 years in favor of the microdebrider. On the other hand, complications (bleeding) were more frequent in the microdebrider group than in the radiofrequency group. The authors concluded that microdebriders have better long-term efficacy than radiofrequency, but with a more frequent rate of complications (53).

Nery *et al.* conducted a prospective observational study on 13 patients, aimed at investigating whether the mechanical damage caused to the nasal mucosa during microdebrider turbinoplasties was followed by anatomical and functional recovery. A bilateral lower turbinoplasty with a microdebrider was performed (resection of the mucosa and the corpora cavernosa, preserving the turbinal bone and the periosteum, in the medial and lower part of the lower turbinates), followed by tamponade of the nasal cavities. The authors did not report any occurrence of scabs postoperatively (at 4 months). After visualization under an electron microscope of a differentiated respiratory mucosa 4 months postoperatively, the authors concluded that mucosal and submucosal resection preserving the periosteum led to structural and functional regeneration of the mucosa (54).

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4. Diagnosis

The diagnosis of VS is not consensual (6, 31).

The diagnosis is clinical, based on the symptomatology expressed by the patients and the endoscopic examination of the nasal cavities (6, 31).

4.1. Clinical

4.1.1. Functional signs

Paradoxical nasal obstruction is the most characteristic symptom, the patient describing a sensation of dyspermeability of the nasal cavities whereas the nasal cavities appear largely permeable on endoscopy (7, 9, 11).

This sensation may be coupled with the lack of sensation of air passing through the nose (7, 9, 11, 31).

However, there may be VNS despite the absence of perceived nasal obstruction, especially in cases secondary to resection of the middle turbinates (9).

There may be a wide range of associated symptoms (7, 11, 31) among which the following symptoms can be found : ÿ feeling of

suffocation, dyspnoea, hyperventilation; - nasal pain;

ÿ nasal and pharyngeal dryness, crusts; ÿ
posterior rhinorrhea; -
hyposmia; ÿ
anxiety, irritability, depression, difficulty concentrating, sleep disturbance, fatigue; –
hypersensitivity to cold air; -
headaches.

4.1.2. Clinical scores

SNOT-20

The SNOT-20 score is a clinical score validated in 2002 for evaluating the severity of symptoms and the efficacy of therapies in chronic rhinosinusitis (55).

This score was used in SNV by Houser in 2007 in a prospective observational study evaluating the effectiveness of surgical rehabilitation using acellular dermis (8).

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SNOT-22

Since its validation in 2009, the SNOT-22 score has been widely used in everyday practice in the evaluation of the quality of life of patients suffering from chronic rhinosinusitis and in the evaluation of the effectiveness of treatments (56).

The French translation of the SNOT-22 score has been validated (6).

Initially used in the context of chronic rhino-sinusitis, the SNOT-22 score has been used by some authors in the context of the SNV, in particular in the evaluation of the effectiveness of surgical treatments (33, 40, 41, 57-59).

SNOT-25

The SNOT-25 score is a version of the SNOT-20 modified by Houser, with the addition of 5 specific items: *dryness, difficulty with nasal breathing, suffocation, nose is too open* and *nasal crusting* (7).

The validity of this test was studied by Jiang *et al.* (39). The Cronbach score was 0.9 ($p < 0.001$), suggesting good internal consistency. There seemed to be good test-retest reliability (correlation coefficient $r = 0.9$, $p < 0.01$). The authors concluded that SNOT-25 can be used in daily clinical practice for the diagnosis of SNV and the evaluation of the results of rehabilitation surgery. The use of this score to aid in the diagnosis of VNS has also been proposed by other authors (31, 49).

Its French version has not been validated to date.

Other authors have also used the SNOT-25 score to assess the effectiveness of surgical rehabilitation treatments (37, 43, 60-62).

ENS6Q

The ENS6Q score is a diagnostic score specific to SNV. It includes 6 items: *dryness, sense of diminished nasal airflow, suffocation, nose feels too open, nasal crusting, nasal burning.* This score has not been validated in French.

Velazquez *et al.* conducted a validation study of this score in the diagnosis of NSV. Fifteen SNV subjects were included, as well as 30 subjects with chronic rhinosinusitis without polyps and 30 healthy subjects with no history of naso-sinus surgery. The ENS6Q and SNOT-22 questionnaires were administered to participants and repeated at 5-day intervals. Internal consistency was 0.93 (95% CI, 0.90-0.95) for the ENS6Q and 0.94 (95% CI, 0.94-0.96) for the SNOT-22. ENS6Q scores were significantly higher in SNV patients than in patients with chronic rhinosinusitis or healthy subjects. ENS6Q was superior to SNOT-22 in its ability to discriminate SNV patients from patients with chronic rhinosinusitis and healthy subjects, with an area under the curve of 0.97 (95% CI: 0.93-1.00) versus 0.67 (95% CI: 0.50-0.85) and 0.80 (95% CI: 0.65-0.94) respectively. A score greater than or equal to 11 out of 30 reliably predicts the presence of VNS, with a sensitivity of 86.7% and a specificity of 96.6% (63).

Several authors recommend the use of this score in the diagnosis of VS (12, 64).

In many studies, an ENS6Q score ÿ 11 is defined as an inclusion criterion as a patient with VNS (40, 57-59, 65-68).

Amanyan *et al.* studied the validity of the ENS6Q score to differentiate patients with VNS from patients with primary nasal obstruction (related to septal deviation and/or

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inferior turbinal hypertrophy). Fifteen patients suffering from VNS were compared to 30 patients suffering from unilateral or bilateral nasal obstruction, related to septal deviation and/or inferior turbinal hypertrophy, and having no history of naso-sinus surgery. The total ENS6Q score was significantly higher in the SNV group, as were some items such as *dryness, lack of air sensation going through your nasal cavities, nose feels too open, nasal burning.* There was no significant difference between the two groups for the *suffocation* and *nasal crusting items.*

The authors emphasize above all the performance of the item *nose feels too open,* whose score was equal to 0 in the 30 patients who suffered from primary nasal obstruction. Unlike Velasquez *et al.* who established a threshold value of 10.5 to discriminate SNV patients from healthy subjects or subjects suffering from chronic rhinosinusitis, the authors suggest retaining a threshold value of 12 to better differentiate patients suffering from SNV from patients suffering from obstruction nasal due to a septal and/or turbinal cause (69).

4.1.3. Physical examination

The endoscopic examination of the nasal fossae finds permeable nasal fossae. Turbinal surgery stigmata are observed with totally or partially missing turbinal structures. The mucosa is often pale and dry. Crusts are frequently observed (7, 11, 31, 49).

4.1.4. Diagnostic tests

The cotton swab test is a simple diagnostic test recommended by many authors (4, 7, 8, 12, 31, 49, 64).

The validity of this test was studied by Thamboo *et al.* in a comparative study of 15 SNV patients (diagnosed on a history of turbinal surgery and an ENS6Q score ÿ 11) and 18 control patients with naso-sinus pathology without SNV with an ENS6Q score ÿ 10 (chronic rhinosinusitis, nasal obstruction architectural). A piece of cotton (approximately 1 cm wide by 2 cm long) was positioned in place of the missing inferior turbinal structure (without local anesthesia). The ENS6Q score was noted before then 10 minutes after placement of the cotton, then 10 minutes after its removal. It should be noted that the insertion and removal of the cotton was done "blind" with false simulations of the insertion and removal and with the exclusion of patients reporting a change in their nasal ventilation despite the absence of insertion. placement or withdrawal of the cotton to limit the placebo effect (no patient having been excluded from the study in this context). The authors observed a significant improvement in the ENS6Q score in the SNV group with cotton in place (+ 12.86 points on average), with no significant difference in the control group. An improvement in the ENS6Q score of 7 points corresponds to the threshold calculated as clinically significant in the improvement of VS symptoms (68).

The cotton test also has a pre-therapeutic usefulness in the event of a rehabilitation surgery project (endonasal microplasty). For Houser, it is even essential to carry out a cotton test before implantation, to define the best size and the best positioning of the implant (8).

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4.2. Complementary explorations

4.2.1. Rhinomanometry

Rhinomanometry is of no value in the diagnosis of VS (31, 40).

It makes it possible to objectify the absence of obstacle by finding normal or even lowered values (8, 17, 31).

4.2.2. Place of imagery

For Kuan *et al.,* VNS is a diagnosis of exclusion, which must be based on the exhaustive collection of the patient's history and the findings of the endoscopic examination. Imaging can be useful to objectify stigmata of previous turbinate surgery, but is not essential for establishing the diagnosis (11).

Thamboo *et al.* sought to assess whether radiographic features could be useful in making the diagnosis of SNV. CT scans of SNV patients were compared to CT scans of patients with a history of turbinal surgery without SNV and to CT scans of healthy subjects, with numerous CT measurements taken. For the authors, SNV patients could be differentiated from patients with a history of turbinal surgery without SNV and from healthy subjects based on the measurement of the thickness of the septal mucosa at the middle part (> 2.64 mm) and posterior (> 1.32 mm) of the nasal cavities (67). For Gill *et al.,* it is an interesting tool but still presents insufficient evidence to be routinely recommended as part of the diagnostic work-up for SNV (70).

4.3. Resounding

Manji *et al.* assessed the severity of mental health disorders and functional impairments in SNV in a study of 53 SNV patients. The scales used were the PHQ-9, GAD-7, ESS, WPAI and EQ-5D-5L scores. The authors observed a high prevalence of anxiety-depressive disorders in the SNV (68% moderate and/or severe depression and 66% moderate or severe anxiety disorders). The severity of empty nose symptoms was correlated with the severity of psychiatric disorders (66).

Huang *et al.* studied the association between the items of the SNOT-25 score and the severity of anxiety-depressive disorders in 68 SNV patients, before and after surgical rehabilitation (by submucous implantation of porous polyethylene), using BDI- II and BAI. They observed a strong association between SNV and anxiety-depressive disorders: 38.3% moderate to severe depression and 53% moderate to severe anxiety disorder in this cohort. Anxiety and depression scores were correlated with sleep disturbances and empty nose symptoms. For these authors, a SNOT 25 score > 60, and more specifically a sleep disorder item score > 18 and an empty nose item score > 14 are predictive of moderate to severe depressive disorder. After rehabilitation surgery, the improvement in the depression score was correlated with the regression of sleep disorders and symptoms of empty nose. The authors concluded that sleep disturbances and empty nose symptoms contributed to the anxiety-depressive disorders frequently found in the VNS (71).

In a second similar work, Huang *et al.* then studied the association between SNOT 25 and ENS6Q scores and the severity of anxiety-depressive disorders in the SNV, before and after rehabilitation

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surgery, out of a total of 74 SNV patients. The preoperative SNOT-25 score appears to correlate better with postoperative psychological status than the ENS6Q score. For the authors, SNOT-25 scores > 70 and > 74 are predictive of the presence of postoperative anxiety and depression, respectively (72).

Kim *et al.* compared the degree of depression between 24 SNV patients and patients suffering from other naso-sinus pathologies (chronic rhinosinusitis with or without polyps, allergic rhinitis). Depression was observed in 71% of patients in the SNV group, with varying degrees of severity, significantly higher than in the other groups (19%, 15% and 27% respectively). No significant correlation was noted between nasal cavity volume and BDI score in the SNV group (35). Similarly, Lamb *et al.* observed a higher prevalence of anxiety-depressive disorders in SNV subjects than in subjects with chronic rhinosinusitis. A somatization disorder was present in 53% of SNV patients, compared to only 14% of CRS/CR patients ($p < 0.0001$) (73).

Due to high rates of depression and anxiety in these patients, Gill *et al.* encourage clinicians to systematically assess psychiatric comorbidities in SNV subjects (using the PHQ9, PHQ2, and *Beck's Depression Inventory scales)* (12).

The prevalence of suicidal ideation in SNV patients has only been investigated in one study. Of the 62 SNV patients included, 23 patients had suicidal thoughts. The authors used item 9 of the BDI-II: 20 patients had a score of 1 (I sometimes think about killing myself, but I will not do it), 2 patients had a score of 2 (J would like to kill myself) and 1 patient had a score of 3 (I would kill myself if given the opportunity). The authors also demonstrated that the *nose feels too open* item of the preoperative ENS6Q score was significantly different between patients without suicidal ideation and patients with suicidal ideation (74).

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5. Support

5.1. Medical

5.1.1. Somatic

Medical treatment is essential and must always be initiated as first-line treatment (6).

The terms of this treatment are not consensual.

Different conservative treatments can be offered, combining nose washes (saline, sulfur derivatives), nasal moisturizing ointments, local or systemic antibiotics, aerosols, local corticosteroids (2, 12, 31).

Large volume nose washes would be preferred to sprays due to better distribution on the mucosal surface of the nasal cavities. Using a home humidifier could be beneficial (11).

However, these treatments seem to be less effective in VNS than in atrophic rhinitis (38).

The addition of menthol to local treatments could be beneficial on the sensation of nasal obstruction (29).

Pulmonary rehabilitation appears to be a useful therapeutic approach in SNV patients with associated hyperventilation syndrome (32).

5.1.2. Psychiatric

As indicated above, the prevalence of concomitant anxiety-depressive disorders in the SNV is very high: 38% of moderate to severe depression and 53% of moderate to severe anxiety disorder in the cohort of Huang et al . (71), up to 2/3 of patients in the cohort of Manji *et al.* (66), 71% depression of varying degrees of severity in the cohort of Kim *et al.* (35).

Many authors therefore recommend systematic screening for anxio-depressive disorders allowing the establishment, if necessary, of psychological and/or psychiatric care (12, 31, 64).

For Lee *et al.,* the anxio-depressive symptoms of VNS could be improved by a single surgical treatment without cognitive therapy, or associated antidepressant or anxiolytic treatment. The symptoms of SNV patients with the worst preoperative BDI-II and BAI scores would be the most improved after surgical treatment (75).

Tien *et al.* observed that in patients suffering from ENS-type VNS (patient with a history of turbinoplasty, without identifiable loss of turbinal substance) and presenting a somatization disorder, psychological management (cognitive-behavioral therapy) associated with a antidepressant treatment allowed a decrease in disabling symptoms as well as an improvement in anxio-depressive disorders (76).

5.2. Surgical

Surgical treatment should only be considered after maximal medical therapy has failed (11, 64).

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Houser recommends waiting a year after causative turbinate surgery before attempting surgical repair (8), 6 to 12 months for Talmadge (64).

5.2.1. Implants (endonasal microplasty)

The principle of reconstructive surgery for the SNV is to reduce the volume of the nasal fossae with the aim of increasing nasal resistance to airflow, increasing air humidification (8), improving the vascularization of the fossae nasal passages (77) and promote the regeneration of dirty nasal mucosa (60).

5.2.1.1. Positioning

The different implants used are placed in the submucosal position:

- subperichondrial and subperiosteal for implants positioned at the level of the nasal septum facing the missing turbinal structure (8, 43, 58, 62, 77);
- subperiosteal for implants placed at the level of the inter-sinuso-nasal septum (8, 36-38, 41, 43, 77) or the floor of the nasal cavities (8, 37, 41, 43, 58, 75, 77);
- under the mucosa of the remaining inferior turbinate (8).

There are techniques described under general anesthesia or under local anesthesia according to the authors quoted above.

Many authors systematically carry out a preoperative cotton test, the interest of which is twofold: to verify that the patient will benefit from the surgery (11) and to define the best positioning as well as the adequate volume to be implanted (4, 8) .

5.2.1.2. Injectable materials

Carboxymethylcellulose/glycerin gel

The use of this material was studied on 14 patients with a history of turbinate surgery with clinically objectified substance loss, ENS6Q score > 11 and positive cotton test. After multiple injections to the anterior part of the floor of the nasal cavity and the nasal intersinus septum, the authors observed an improvement in the clinical scores ENS6Q, SNOT-22, GAD-7 and PHQ-9 at one week and one month. postoperative. However, this effect was no longer observed at 3 months postoperatively due to rapid resorption of the material. The authors consider its easy use under local anesthesia in an ambulatory procedure, interesting to quickly improve the symptoms of the patients while waiting for a more durable implantation surgery (57).

5.2.1.3. Implantable materials

Porous polyethylene

Its use has been studied by several authors (33, 37, 39, 58, 75, 77).

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Fu *et al.* studied the submucosal positioning of porous polyethylene in 19 SNV patients, in comparison with 12 patients with chronic hypertrophic rhinitis (CHR), undergoing turbinoplasty. Preoperatively, SNOT-22 scores were similar for both groups and BDI-II and BAI scores significantly higher in SNV. Postoperatively, the authors observed a significant decrease in postoperative SNOT-22 scores in SNVs and CHRs from 3 months postoperatively and a significant decrease in postoperative BDI-II and BAI scores in SNVs. from 3 months post-operative (33).

Huang *et al.* also studied this type of implant, positioned submucosally on the inter sinuso-nasal septum or on the floor of the nasal fossa in 54 SNV patients. The authors observed a significant decrease in SNOT-25, BDI-UU and BAI scores at 3, 6 and 12 months postoperatively. The authors consider that the anxiety-depressive status of SNV patients is the most important predictor of the results of rehabilitation surgery and could predict the persistence of symptoms after surgery. BDI-II scores > 28.5 and BAI > 20.5 would be predictive of the persistence of symptoms after rehabilitation surgery. Appropriate preoperative psychological support could optimize surgical outcomes (37).

Jiang *et al.* studied the use of porous polyethylene in 19 SNV patients with a history of partial or total turbinectomy. The implant was positioned submucosally on the nasal intersinus septum below the remaining inferior turbinate remnant, and for some more severely affected patients, also on the floor of the nasal cavity and on the septum in front of the missing inferior turbinate .
The authors did not observe any displacement or resorption of the implant, nor any inflammatory or allergic reaction. Partial extrusion was observed. All patients experienced clinical improvement, experiencing less dyspnea, less dryness and crusting. The patients all had an increase in nasal resistance after surgery. The SNOT-20 score was significantly improved at 3 and 6 months postoperatively, and not significantly at 1 year postoperatively. For the authors, porous polyethylene is superior to other synthetic materials or cartilage, with reduced risk of migration and infection, potential for neovascularization, and availability of suitable prefabricated forms (77).

Lee *et al.* conducted two studies on the subject. In 2016, they investigated the impact of surgical rehabilitation of the SNV on anxiety and depression scores. Twenty SNV patients were included. Porous polyethylene implants or autologous bone grafts (taken from the bone septum) were positioned submucosally on the floor of the nasal fossae. They observed a significant decrease in BDI-II and BAI scores postoperatively. For the authors, the symptoms of SNV patients with the worst preoperative BDI-II and BAI scores would be the most improved after surgical treatment. (75). In 2018, Lee *et al.* compared the porous polyethylene implantation sites in 30 SNV subjects, the implant being positioned submucosally at the floor of the nasal fossa for 14 patients and in the inter-sinuso-nasal septum for 16 patients. They observed a significant decrease in the total SNOT-22 score postoperatively in both groups with no difference between the two groups. Concerning the rhinological symptoms and the sleep, the improvement was more notable in the group of implant in the intersinuso-nasal septum than in the group of implant in the floor of the nasal cavity. The BDI-II and BAI scores were significantly reduced postoperatively in both groups, with no difference between the two groups (41).

Tam *et al.* studied the use of porous polyethylene implanted submucosally at the floor of the nasal cavity +/- on the septum in 18 SNV patients. The SNOT-22 score was significantly reduced at 3 months and 12 months postoperatively. The authors reported two complications: a patient who developed chronic hypertrophic rhinitis four years after implantation requiring

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long-term nasal corticosteroid therapy and a patient who presented with extrusion of the implant 6 months after surgery with the need for partial section and removal under local anesthesia (58).

Non-porous beta-tricalcium phosphate

A study focused on the use of this material in 14 patients who developed VNS after bilateral total inferior turbinectomy or turbinoplasty. The implants were positioned submucosally along the inter-sinuso-nasal septum. The authors noted a statistically significant improvement in the NOSE and RhinoQol scores postoperatively. No complications involving the lacrimal tract were observed (36).

Acellular dermis

Houser studied the use of this material in 8 SNV patients. The positioning of the implant depended on the findings concerning the missing turbinal structures (nasal septum, floor of the nasal cavity, remnant of inferior turbinate). He observed a significant decrease in the SNOT-20 score post-operatively. Two patients had minor implant exposure within the first two weeks, but healing then proceeded without sequelae or infection (8).

Saafan conducted a prospective randomized study comparing the use of acellular dermis and silicone in 24 SNV patients. The implants were positioned submucosally on the septum, the floor of the nasal fossae and the inter-sinuso-nasal septum. The SNOT-25 score was significantly improved in both groups, with no significant difference between the two groups. Complications were observed, namely 4 silicone extrusions. Three minor exposures of acellular dermis in the first two postoperative weeks healed without complication. The author concludes that silicone and acellular dermis are equally effective (43).

Thamboo *et al.* studied the use of acellular dermis and extracellular matrix isolated from the in porcine testine (SIS, *Small Intestine Submucosa)* in 10 SNV patients. The authors observed a significant reduction in ENS6Q, PHQ-9, GAD-7 and SNOT-22 scores at 3 and 6 months postoperatively. However, the authors emphasize the need for longer-term follow-up, in particular to study graft resorption over time (59).

Cartilage (septum, concha, costal)

The use of cartilage for endonasal microplasties has been studied by Jang *et al.* in a study of 17 SNV patients. The grafts could be septal cartilage, concha cartilage if septal cartilage harvesting was impossible (history of septoplasty) or autologous or even homologous costal cartilage (38). Nine out of 12 patients said they were satisfied with the results of the surgery, with a statistically significant improvement in the symptoms expressed before the surgery (excessive airflow, nasal obstruction, nasal or facial pain, rhinorrhea, headache).
Undercorrection was observed in 3 patients, two of whom underwent a second operation with the addition of contralateral conchal cartilage (38).

Jung *et al.* conducted a study of 31 SNV patients, among whom 17 patients had been operated with a concha cartilage implant and 14 patients with septal cartilage. The implant was positioned subperiosteally opposite the inter-sinuso-nasal septum. Conchal cartilage was used for small volume defects, rib cartilage for large volume defects, based on the surgeon's preoperative assessment. Under study, the use of cartilage

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costal increased in front of the observation of better results using this material. The authors reported a statistically significant improvement in the SNOT-25 score in both groups, with significantly greater improvement in the costal cartilage group than in the conchal cartilage group. The authors did not report any complications (60).

Costal cartilage taken from cadavers was used in a study of 5 SNV patients, positioned facing the inter-sinuso-nasal septum. Numerical flow simulation models *(Computational Fluid Dynamics* – CFD) were carried out pre- and post-operatively. The authors observed that surgical rehabilitation modified the parameters of dirty ventilation by decreasing the air passage in the middle corridors and increasing the air passage in the lower corridors, in a way correlated with the improvement of the patient symptomatology (78). The same material was used for 17 SNV patients, also implanted next to the inter sinuso-nasal septum. The authors observed a significant decrease in ENS6Q, SNOT-22, GAD-7 and PHQ-9 scores up to one year postoperatively. The authors underline the fact that costal cartilage grafts taken from cadavers make it possible to avoid the morbidity associated with autologous removal, and in particular the risk of pneumothorax (79).

Ushio *et al.* used conchal cartilage implanted in the floor of the nasal fossae in 6 SNV patients, and observed an improvement in symptomatology (significant reduction in SNOT-20, SNOT-25 and ENS6Q scores) and an increase in nasal resistance in post-operative (80).

Bone (bony septum)

A study by Lee *et al.* focused on the implantation of autologous bone grafts (taken from the bony septum) or porous polyethylene. The BDI-II and BAI scores were significantly improved postoperatively (75).

Silicone

Saafan conducted a prospective randomized study comparing the use of acellular dermis and silicone in 24 SNV patients (see *above)* (43).

SIS *(Small Intestinal Submucosa)*

Velasquez studied the use of extracellular matrix isolated from pig intestine (SIS, *Small Intestine Submucosa)* in 3 SNV patients, in submucosal implantation next to the missing inferior turbinate. The SNOT-25 score was improved up to 12 weeks post-operatively, with no observed complications, but the authors weigh these results against the limitations linked to the small number of subjects and the absence of long-term follow-up (62).

Thamboo *et al.* studied the use of extracellular matrix isolated from pig intestine (SIS, *Small Intestine Submucosa)* and acellular dermis in 10 SNV patients (see *above)* (59).

5.2.2. Injections

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Carboxymethylcellulose/glycerin gel

Fourteen patients benefited from the injection of *CMC/glycerin gel,* by multiple injections into the anterior part of the floor of the nasal fossa and the intersinuso-nasal septum, according to the tissue loss and the result of the test at the cotton. Between 0.4 and 0.8 mL were injected in 4 or 5 injections per side. ENS6Q, SNOT-22, GAD-7 and PHQ-9 scores were reduced at 1 week and 1 month postoperatively but the effect was not maintained at 3 months postoperatively. No complications were observed. For the authors, the *CMC/glycerin gel* is an interesting choice of temporary implant due to its resorption after 2 to 3 months and its good tolerance, with limits related to the resorbable nature of the product. Its easy use under local anesthesia in an outpatient procedure is of interest in rapidly improving the symptoms of patients awaiting longer-lasting implant surgery (57).

Autologous Stromal Vascular Fraction (SVF)

Kim *et al.* studied the injection of autologous stromal vascular fraction (SVF) obtained by removing abdominal fat, injected into the medial part of the two inferior turbinates in SNV patients after partial turbinectomy. Patients with a history of radical total turbinectomy were excluded because they were considered better candidates for rib cartilage reconstruction.
Only 2 out of 9 patients felt improved after the procedure, and the SNOT-25 score was not signifi cantly different from the preoperative score. Nevertheless, at 6 months after injection, the concentrations of IL-1ÿ and IL-8 were significantly reduced, indicating a reduction in the level of inflammation of the mucosa after the injection ($p < 0.005$). The authors hypothesized the need for multiple injections to observe clinical efficacy (61).

Hyaluronic acid

Three SNV patients received injections of hyaluronic acid in the inferior turbinates and in the antero-inferior part of the nasal septum. Initially, patients experienced subjective improvement, with improvement in acoustic rhinometry score up to 6 months. At 12 months, only one patient felt the persistence of the effects of the surgery. The authors did not observe any inflammation, allergic reaction, extrusion or displacement of material (81).

Fat stem cells

Xu *el al.* studied the use of adipose stem cells obtained after removal of abdominal fat and injected into the medial part of the two inferior turbinates of 30 SNV patients. They observed an improvement in symptoms in 28 patients (better hydration of the nasal mucosa, reduction in pain and nasal obstruction on inspiration, improvement in the quality of sleep). In 2 patients, the improvement was less significant, with only a reduction in the dryness of the nasal cavities. On endoscopy at 3 months, the authors noticed a decrease in secretions and crusts. Saccharin clearance was improved at 3 months and 6 months, difference not significant at 9 months. The authors also observed a decrease in inflammation of the nasal mucosa (alignment of collagen fibers, increase in proteins produced by goblet cells, presence of epithelial markers such as cytokeratins 7, 14 and 19). For the authors, the injection of adipose stem cells could induce epithelial cells to improve the function of the nasal mucosa in the SNV (82).

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5.2.3. Other

For Kuan *et al.,* a complete closure of the nostrils could be considered in the most severe and refractory cases (11).

5.2.4. Effectiveness evaluation

If these techniques seem promising, the level of evidence of the effectiveness of these techniques remains low, and more powerful studies, with control groups, studying the effectiveness and long-term safety are necessary (12).

In a meta-analysis of 6 studies involving a total of 122 patients, Ma *et al.* found a significant improvement in the SNOT score of 23.16 points on average postoperatively (95% CI 21.06-31.21, $p < 0.00001$). The authors also found a significant difference between the groups of autologous and non-autologous implants in terms of improvement in the SNOT score, with better efficacy of the non-autologous implants ($p < 0.05$) (83).

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Table 1. Narrative reviews and viewpoints

Author, Year, Reference	Type of re seen	Level of evidence	Definition	Preva lence/Inci dence	Diagnostic	ace factors companies Pathophysiological hypotheses	Treatment
Chhabra, 2009 (7)	Review narrate tive	4	The loss of turbinal substance as associated with symptoms of atrophic rhi nitis has been referred to wrong "empty nose" in the literature, but these two pathologies are distinct entities. SNV and atro rhinitis phic have common symptoms. The loss of substance turbi nal in rhinitis primary atrophic disease reflects the below underlying pathology. On the other hand, NSV is an iatro embarrassed Atro rhinitis phic can	Few pa would like to develop lop A SNV after turbinectomy, but this disabling complication re leaves his diagnosis by the ENT. Patients with VNS develop it lop most of the time after a turbi resection nal lower. NSV can occur from several months to several years after surgery.	The main patient complaint is nasal obstruction paradoxical, with, on examination, largely permeable nasal cavities. This sensation may be coupled with the absence of the sensation of passing air inthe nose. Dyspnea may be felt, which may lead to hyperventilation. This may result in difficulty concentrating. ration, fatigue, irritability, anxiety and pressure. Crusts and pains may be present.	The reason why some patients will or will not develop VS is not known. A hypothesis is the weak regeneration er veuse after tis resection sular. Another hypothesis is that the specific anatomy at to each patient leads to differences in terms of re nasal airflow partition after turbinectomy. A	The cotton test is useful for making a surgical decision, in determining the dimensions and the location ideal of an im potential plant. Patients who experience a improvement subjective of their symptoms 20 to 30 minutes after placement of the cotton can be offered the placement of an implant submucosa.

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occur after a turbinectomy, but may also be secondary say To A trauma, infectious pathology or self-im mune.

In all the cases of VNS, patients have a history surgical tooth turbine energy. SNV most often seems associated cie to a chi ex turbinal urgia tensive. Authors estimate that about 20% of patients develop will lop one SNV after re section turbi nal, and that a larger proportion of patients will suffer at least mother of one drought nasal.

The drought na dirty is a constant complaint and is ob jectivated on examination of the nasal ca The authors recommend need to base the diagnosis of SNV on he combination most common symptoms: paradoxal nasal obstruction, dyspnoea, nasal dryness and pharyngeal, hyposmia, depression. The SNOT-25 score (SNOT-20 score modified by Houser with the addition of 5 specific items) can help in the diagnosis of VNS. Endoscopy of the nasal cavities re find a mu dry pale tail, And sometimes crusty, and lack of turbinal tissue.

An improvement of

loss of turbinal tissue results would be tur bubbles and avities. less good sense tion of no air. wise A loss of function of humidifier tion and re heating would cause crusts, altering the sen air step station. wise Weak re resistors na dirty cause a alteration of pul monary function, since the resistances na dirty are essential to lung function (or virtue of the

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				symptomatology felt 20 to 30 mi nutes after positioning of a cotton wet in the area surgical resection wedge should be used to make the diagnosis of SNV.	bronchioles peripherals and ventilation optimization tion alveo lar).		

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Coste, 2012 (31)	Review narrative	4	The SNV is a complication that may occur several months or years after a turbinectomy. He is to be distinguished from rhinitis atrophic, which is a primary impairment of the structures naso-sinuses of unknown etiology naked.	bearing is unknown because of the absence specific study. For Chhabra and Houser, the risk of occurrence of a SNV is estimated at 20% In THE aftermath of a turbinectomy. Major risk in case of chi radical surgery (total turbineectomy or sub total) Case of SNV reported more rarely in failure case tions partial, especially in case of tur binectomy partial involving the head	Lack of consent above Clinical diagnosis: 1. Interrogation finding a large symptomatic procession: - nasal obstruction; - feeling of suffocation cation, dyspnoea; - nasal pain; - nasal dryness And pharyngeal, scabs; - anxiety, irritability, depression, difficulty concentrating, sleep disorder; - loss of sensation of passage of air in the nose; - hypersensitivity to cold air; headaches. - 2. Impact on quality of life. 3. Cotton test: feeling improvement tie 20 to 30 minutes after placing a moistened cotton ball in	Loss of the nasal physiological functions (humidification, warming, purification of inspired air). Amendment of the distribution of the flux na dirty (acceleration and increase in flow in the corridor lower). Alteration of pulmonary functions (loss of resistance na dirty leading to a limitation of lung volume and arterial oxygenation).	Association frequent with of the psychiatric disorders and disorders psychosomatics (fibro myalgia, functional colopathy).	Prevention: favorize a chi conservative surgery (turbinoplasty, turbinectomy partial retaining at least 50% volume turbine). Medical treatment dical Washes, oils, local or general antibiotic therapy, aerosols, rhinocorticoids, with an effective cited less than in rhinitis atrophic. Menthol may have an effect efficiency on the obs sensation nasal destruction. Psychological support. chi treatment surgical

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				inferior turbinate laughing. case again rarest of SNV after turbinectomy mean.	the nasal cavity in level of substance loss. 4. Dirty endoscopy finding a wide permeability of the nasal cavities with turbi structures fins missing or largely amputated. Rhinomanometry confirm the absence nasal obstruction, finding resistance normal or weak. Standardized questionnaires such as the SNOT-20 or the SNOT-25 are useful for diagnosis and therapeutic decision-making.			Submucosal implants positioned on the septum, at the dear plane of the fossa nose or on the inter si partition nuso-nasal.

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Gill, 2019 (12) Review narrate tive	4	Characterized clinical disorder by an obstruction paradoxical despite an objective vacuity of the birth pits dirty.	If by name worthy authors demonstrated an association tion between re section turbine And obstruction paradoxical, others don't have cumented none case obstruction nose after turbinectomy less than tale. None less, in these studies, up to 6% of patients had at least no improvement ration of their ventilation na dirty despite a tur volume binary reduced. there is no evidence	Nasal obstruction paradoxical despite an emptiness of pits nasal. Dyspnea, dried nasal pain, burning sensation nasal passage, feeling of suffocation, leading to impaired of the quality of life. Two tools can help in the diagnosis of SNV: - the ENS6Q score; - the cotton test. These two new tools still lack the level of proof and their use must therefore be cautious, in addition to the history and physical examination.	The physiopathology of SNV remains controversial, probably multifacto rielle. The SNV can be different rhinitis atrophic by the absence of in inflamed filtrate matrix To histology. The drop in resistors nasal increases the vo lights of air inspired. The interactions between the mu cue and inspired air are altered, leading to a humidification and a stove insufficient air health	Because of a high rate of anxiety disorder depression associated with naso-sinus pathologies hers, practitioners are encoura able to assess the psychological state of SNV patients suffering from rhinosinusitis chronicle, using in particular is lying of scales (PHQ9, PHQ2, BDI).	The authors re order from preserve at least 50% of the horn volume net less during any surgical procedure endoscopic. Different treats kept tors can be offered, combining the nasal washes (saline serum), moisturizing topicals, use of a humidifier. An antibiotic tea rapie and topical corticosteroids can be used. An increase in volume turbinal by an implant seems promising

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			sufficient to demonstrate that the tur binectomy average increases the risk of occurrence of a SNV.		inspired. A trigeminal dysfunction could be responsible for the sensation obstruction nasal. The dysfunction of the cool down ment of the mu questing by the inspired air activates the same areas cerebral than when inhaling CO2. A di minutes of resistors nasal East suspected of causing a malfunction in the recruitment alveolar.		but does not yet have a level of high proof.

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This could lead to a

hyperventilation syndrome, which may be associated at SNV at

up to 77% of patients.

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Houser, 2006 (9)	Point sight	4	SNV patients can be classified into 4 groups according to the resection of turbinate tissue: - ENS-IT: partial or total amputation of the turbinates lower; - ENS-MT: partial or total amputation of the turbinates means ; - ENS-Both: horn net lower and means have been totally or partially resected; - ENS-type: no loss of turbinate tissue is visualized, but the patients present with symptoms of NSV, have a history of turbinal surgery, and their symptomatology improves with co test your.	Some patients don't die will not develop VNS after total turbi nal amputation, SO that others develop will lop one SNV after resection partial. The SNV can appear from several months to several years after turbinal surgery, possibly in due to subsequent atrophy.	The most noticeable symptom is the obstruction paradoxical nasal expression: the patient describes a sensation dyspermeability of the nasal cavities whereas in endoscopy the dirty nasal fossae appear largely unsightly. per ENS patients TM often report pain as society To there nasal breathing. They describe an obs nasal destruction mo derea and some crusts. ENS patients Both feel the more embarrassment.			Implants submucosa allow to reconstruct the cornets man quants.

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Kuan, 2015 (11)	Review narrate tive	4	The term "nose syndrome" void" (SNV) was first described in 1994 by Kern And Stenkvist. It is a rare condition occurring years born after nasal surgery, mainly a turbine surgery. Although it is a dreaded complication, this condition is still debated in terms of its definition. tion and its dia gnostic. The terms "rhi atrophic nite" and "SNV" are often used in differently one the other. Moore and Kern were the first to describe the occurrence of rhinitis atrophic	An SNV generally produced for years born after turbinectomy lower and or mean. However, the majority of patients who benefit of a surgery turbinal surgery, including turbinectomy total, do not develop SNV. Three total studies health 1,700 patients having had turbines lower tomie total losses reported no cases of occurrence of SNV, with follow-up ranging until 15	There are no objective clinical signs characteristic of SNV. In endoscopy pie, the lower and/or middle turbinates may be missing or reduced in volume, the nasal cavities being then largely permeable. The mu tail is pale and dry. scabs and secretions mucopurulent may be present. Symptoms are usually the excessive presence of nasal crusts, obstruction na dirty paradox, a bad smell emanating from the cavity nasal. Other symptoms may be associated, such as facial pain,	Anatomical change leading to an alteration of the environment is lying local (temperature and humidity). Alteration of the cooling function of the mu queue. Mech Dysfunction neuro isms sensory.		The treatment SNV Medical similar to that of rhinitis atrophic, but it remains less effective that in this der nary. This includes hydration of the nasal mucosa with saline or oils, adequate daily fluid intake, and closure periodic nostrils. The use of high volume washes is preferable to the use tion of sprays due to a better diffusion Zion to in seems to

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secondary possibly secondary

go to surgery.

Atro rhinitis

Secondary atrophic rhinitis can cause PVS, but atrophic rhinitis can occur without PVS (primary atrophic rhinitis).

years. Similarly, in any case of

SNV was not described after turbinectomy average over 1,000 patients.

Others at tors estimate the impact of 20% SNV after lower turbinate surgery, but no

study To large scale has not been conduct to estimate the inci dence of the SNV after turbine surgery.

headaches, dryness mu

dyspnoea, epistaxis, anosmia, sleep disturbances, rhinorrhea mu

copurulent.

The feeling of not not feel the air pass is not relieved by mouth breathing and has often

a negative impact on psychological well-being, with manifestations such as anxiety, depression, anger, frustration, irritability, fatigue.

VNS is a diagnosis of exclusion, and should be based on the background of the patient and the endoscopic aspect. Imaging can find the stigmata of turbinal surgery but is not

mucous surface.

The use of a humidifier to home could be beneficial.

Psychological support may be necessary.

A treatment maximum medical must be done before considering undergo surgical treatment.

Houser recommend ask of at tender a year after the causal turbinal surgery before attempt surgical repair. A test at

cotton should be carried out beforehand to determine whether the patient will withdraw

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				essential for diagnosis.			a benefit of surgery. Different mate rials can be used. THE implants are positioned in the subperichondral plane of the septum or floor of the nasal cavity, or on the septum in ter-sinuso-na dirty. Surgery seems improved significantly reduce the quality of life of patients with a low rate of complications. A complete closure of the nostrils could be considered in the most severe cases. more severe and refractory.

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Payne, 2009 (10)	Point sight	4	The SNV should not not be considered a form rhi secondary nite atrophic but defined as the existence of a complex symptomatology including, at a minimum, the sensation of paradoxical nasal obstruction, associated with a turbinary, complete Or partial. The appearance of an SNV in the aftermath of a turbinectomy remains a controversial subject.	discrepancy according THE studies: - 89% of scabs after turbinectomy less than tale in a series ; - *conversely,* absence of occurrence of severe rhinitis physical after turbinectomy less than tale or subto tale in three series of 351, 1,156 and 186 patients respectively, with follow-up long term up to 10-15 years. VNS occurring after turbinectomy average is even more	Nasal obstruction paradoxical, concentration disorders, chronic asthenia, frustration, irritability, anxiety, depression	Amendment of the diagram of ventilation na dirty after turbinectomy: increase in turbo air shots, or stupid milk column of more laminar air entrains nant a decrease in contact with the nasal mucosa. Patients with rhinitis al allergic or rhinosinusitis may be less likely to develop reduce certain symptoms due to the persistence of a hypertrophy of the	It's disturbing to observe a significant level of psychological disorders associated with SNV. In this meaning, the SNV could be related to other pathologies where a link is ob served between the psychological distress and tolerance disease, such as tinnitus. Some patients may suffer troubles neurotics even before chi roaring, laughing merely	Treatments con servers: the nasal passages, application of oils, even prolonged antibiotic in therapy cases of scabs important. Nevertheless, even if the treatment can prove to be effective, it simply makes it possible to relie ger THE symptoms but it is not a solution permed.

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				controversial than the SNV after inferior turbi nectomy higher; several series do not rele before none case of rhinitis atrophic after turbinectomy mean.		na dirty mucous membrane remaining, even after resection tur binary.	exacerbated by manipulation of cor net. A treatment by Amitripty line or Gaba pentine could be advantageous especially in patients whose symptoms are characterized more by pain than by nasal obstruction. These patients might also benefit from blockade of the sphenopala tine ganglion, as in cases Sluder's neuralgia.	

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Scheithauer, 2010 (2)	Point sight	4	The term "nose syndrome" void" (SNV) was first used in 1994 by Kern and Stenkvist to describe areas of surgical vacuity in the region of the inferior and middle turbinates on CT scans of patients having undergone inferior turbinectomies higher Or averages. These patients week suffer more frequently from dryness and nasal crusts. Despite an endona aspect of emptiness dirty, these patients complained of the opposite obs sensation construction nasal, then called "paradoxal".	The prevalence is not known in Germany magne, because of a variable symptomatology and not consensual and the fact that the diagnosis often cannot be definitively confirmed. sure. The SNV on comes after re section of a or more horn net.	The major symptom is obstruction na dirty paradoxical, often accompanied by poorly labeled breathing difficulties. Symptoms present in rhinitis Primary atrophic disease such as recurrent sinusitis, epistaxis, anosmia, septal perforations, facial pain, may also be seen in the SNV.	Decrease in humidity level said air ins worse. Increased speed and temperature decreased by the air inspired. Decrease in re resistors na dirty and air less D heated drives would be a Dysfunction of re nasal flex bronchocon pulmonary triction, which can alter the pulmonary function. Appearance of vortex in the air inspired. turbulence looking inspired. Sudden fall of the pressure gradient between		A treatment conservative is offered, including instillations, ointments, even an anti long-term biotherapy in case of scabs important. These therapies help to relieve symptoms but do not consti kill a permanent solution to the problem. Due to trafficking unsatisfactory conditions, a minimally invasive surgery cones, pre serving the mu nasal queuse, remains one of the more THE important principles

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The SNV is defined like rhinitis secondary atrophic cause ia trogenic.

the anterior parts and posterior fossa na dirty.

naso-sinus surgery his. A discount lower turbinate surgery shouldn't be indicated only after three months of milking ment retained tor without getting improvement subjective nor objective (rhinoma nometry, acoustic rhinometry). In case of rhinosi subacute or associated chronic site, this period of con treatment server should be extended to six months.

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Shah, 2016 (49)	Review narrative	4	Pathology including secondary symptoms to iatrogenic amputation of endona structures dirty, frequently with radiological scars from the amputation of these structures.	Occurring several months to years some patients after resection of cones.	Nasal obstruction paradoxical, dryness and crusts. Pains facials in the VNS occurring after turbinectomy mean. Nasal mucosa pale, dry, presence of crusts. Turbine structures missing. Interest of pulmonary function tests to exclude the presence of associated asthma in case of dyspnoea or feeling of suf focus. Interest of the co test your. The resolution symptoms reinforce the clinical diagnosis. Use of scoring	Alteration of nasal physiology (loss of tissue leads to having a dime nutrition of the mu clearance cociliary, alteration of functions of refreshment and modification of nasal mucosa, neurosen alteration sorial). Decrease in re resistors na dirty leading to a bad or virtue of bronchioles peripherals and an altera tion of the wind tilation alveolar.	Association frequent with problems psychosomatics. User interest reading of BAI scores and BDI-II.	Prevention is essential, as treatment options remain limited to date. A re seek exhaustion tive of there presence of an allergy of other Or factors reversible in dragging a turbinal hypertrophy was born necessary, per putting Most often is "possibly" to establish a medical treatment suitable cal and stay born cessation of reality be a turbinectomy. Medical treatment dical including a hydration of the mucous membrane na dirty with

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					SNOT-25 (modified by Houser).		saline or ointments, a closure in termittent nostrils, the use of humidifica tors. Cognitive therapy and trai ly antidepressants may be indicated. A treatment surgery can be attempted only after medical treatment. optimal callus, the principle of which is to restore nasal physiology by reconstructing sant the missing turbine structure(s).

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Sozansky, 2015 (4)	Review narrate tive	4	The term "nose syndrome" void" (SNV) was first used in 1994 by Kern and Stenkvist to describe areas of surgical vacuity in the region of the inferior and middle turbinates on CT scans of patients having undergone inferior turbinectomies higher Or averages. These patients suffer week more frequently from dryness and nasal crusts, and some patients complained of to a feeling obstruction na filthy paradoxical, despite an endona aspect of emptiness dirty.	The SNV is a recognized complication turbine surgery, mainly turbinecto mies, but also in a less me after safe hard of the procedures less invasive of turboplas ties. The delay of occurrence will from several months to several year born. The impact of SNV after turbinectomy is not known, but it is a rare condition.	The diagnosis of SNV is difficult in reason for absence reliable objective test, the diagnosis being based on the subjective symptomatology expressed by the patient The use of the test with cotton can help in the diagnosis, a regression of the symptomatology 20 to 30 minutes after positioning a damp cotton in the vali nasal cavity in the diagnosis and positioning the pa holds as good candidate for surgery.	Loss of feeling of pit permeability na soiled by alteration of the re function chilling of the mu nasal quesa via TRPM8 receptors. Decrease contacts between the mu queer and looking inspired. Warmer air in the pits n / A dirty. Speed increase inspired air to the posterior part of the pits n / A dirty.		A mini turbinal surgery male invasive is essential, preserving the mucosa. The resection technique under mucosa associated with the laterali station infe cones laughing found the best re long-term results in a random study comparative study of 382 patients followed for 4 years. Restorative surgery with creation of a "pseudo-cor net" improves the conditioning inspired air, with good re results in terms improvement

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					Mismatch between activa reception tors lungs by the inhaled air, and the ab of sense stimulation thermore na receptors salt. THE differ internal ences individual in the receipt post operative nerve damage could explain why only some patients develop VNS and others not, for identical surgeries.		patient symptomatology.

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Talmadge, 2019 (64)	Review narrative	4	The SNV, first described by Stenkvist and Kern, describes all of the complaints expressed by patients, findings physical and associated comorbidities linked to a resection tion turbine agressive.	little gift born concer nant there prevalence of VNS after turbinectomy. Likely impact weak, but probably underdiagnosed. Appearance of SNV from 3 months and up to 5 years after turbinectomy.	Nasal obstruction paradoxical (discordant with the gifts born from the exam physical). Nasal aprosexia: inability of the patient to concentrate and lead a normal life badly due to obsession with sensation nasal obstruction and choking. Use of ENS6Q in diagnosis (a score greater than or equal to 11 out of 30 has a specificity of more than 95% and a sensitivity greater than less than 85% for a diagnosis of VNS). The cotton test is also useful for diagnosing NSV (decline in the ENS6Q score of 7 points after	Amendments of the from meters ventilation na dirty in studies in if nude mulation flows: laminar flow, increased speeds and decrease of ventilation corridors lower with increased airflow in the necks average dormouse. Alteration of the sort function geminal (via receptors TRPM8 which detect the cool down ment of the mu tail). Phenomenon	Co-morbidity important of with year troubles xio-depressive.	Prevention: evi end resections aggressive turbines, give preference to radiofrequency techniques for sequence or section under mucosa. Medical treatment: hydration (emol spray nasal, lients), application of menthol. Treatment by a psychologist or psychiatrist, cognitive-behavioral therapy. chi treatment surgical: did tender 6 to 12 months after SNV cause surgery before planning rehabilitation surgery.

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					place cotton at the level of the loss of substance). Radiological markers appear to be associated with SNV (thickening of mu septal cue).	neuronal regrowth aberrant after turbinectomy.		Location submucosa to recognize kill a neo inferior turbinate. Several mate rials used (injectables, acellular dermis, cartilage, silicone, polyethylene).

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Table 2. Articles on NSV pathophysiology and etiology

Author, Year, Reference	Type of study	Level of evidence	Objective	Population/Method	Stud Parameters die	Results	Discussion/Concluded if we
Choby, 2014 (44)	Systematic literature review	4	Assess the conse quences of resection cones means during surgery endoscopic sinus pain.	9 articles in clus, involving 2,123 patients affected rhinosine chronic site having been operated on by endoscopic sinus surgery with resection of cones means (CM).	Endoscopic appearance of the nasal cavities. Stenosis rate nasal canal postoperative frontal. Olfac quality tion. Quality of life.	Endoscopic appearance of the nasal cavities: - in 4 studies, improvement in cli exam scores in the groups with resection of the CMs compared to the groups where they were preserved (mean follow-ups: 17.4, 36, 50 and 36 months. Resection of the head CM in 3 studies, total mean turbinectomy in study); - in 4 studies, no significant difference between the two groups (mean follow-up: 12, 12, 24 and 36 months) (resection of the head of the CMs in these 4 studies). Rate of post-operative stenosis of the naso-frontal canal: no statistical difference significant rate of canal stenosis naso-frontal (1 study) or	No deleterious effects were found after turbinectomy. mean in the setting of endoscopic surgeries of the bare bones in patients with rhinosinu site chronic. Systematic review limited by lack of high ni studies proof calf.

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					rate of postoperative frontal sinusitis (1 study) between the two groups. Quality of olfaction: - in a cohort study with a mean follow-up of 17.4 months, greater improvement in olfac tometry scores after CM resection (p = 0.045); - in a prospective randomized trial with an average follow-up of 50 months, significant recovery of olfaction after resection of the CMs in patients with preoperative hyposmia (p = 0.0006). Quality of life : in 3 cohort studies (2 with partial CM resection, one with complete CM resection), significant improvement in postoperative quality of life, with no significant difference between the two groups.

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Freund, 2011 **(29)**	Observational prospective study e	3	Compare ce activity rebra by dark MRI between patients SNV and healthy subjects, during respiration, before and after inhalation of limonene and of menthol.	10 patients SNV (tic diagnosis established on a concordant symptomatology in patients with a history of tur binectomies lower and mean bilateral) compared to 15 healthy subjects.	Olfactometry. Rhinomanome tr Function test trigeminal tion by ammonia. MRI function nal: - with free breathing, inhalation of limonene and menthol; - and evaluation of the feeling of dirty na permeability on scale to 4 dots.	2 hyposmic patients out of the 10 SNV subjects and 2 hyposmic patients out of the 15 healthy subjects. Absence of significant difference in the trigeminal function and flow rates at inspiration between SNV and healthy subjects. The subjective feeling of permeability of the dirty nasal fossae was less good in SNV subjects than healthy subjects ($p < 0.00001$), at rest and after inhalation of limonene or menthol. Improved feel nasal permeability after inhalation of limonene and menthol in healthy subjects ($p < 0.00001$) and SNV ($p = 0.01$, and $p = 0.04$). In functional MRI: - deactivation of some brain areas during in halation of limonene and menthol, in healthy subjects and SNV; - deactivation more	Activation of specific brain areas in SNV subjects during self-assessment tion of their feeling nasal permeability, belonging to the limbic system, involved in the regulation of emotions. These same cerebral areas were also activated in an experiment studying a situation of respiratory stress. This parallel may explain a state of "respiratory stress" in SNV patients. Specific deactivation in healthy subjects of certain cerebral areas of paralimbic areas during menthol inhalation, not observed in SNVs. This could testify to a higher

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						important when inhaling menthol; - specific deactivation in healthy subjects of the paralimbic areas and Broca, not observed in subjects SNV; - activation of some brain areas during scoring of the sensation of nasal permeability by the subjects. In SNV subjects, specific activation of certain cerebral areas (cervex, amygdala and temporal lobes).	activation level at rest. The beneficial effect of menthol inhalation could correspond to the deactivation of paralimbic areas. This is why it might be beneficial to include menthol in treatments SNV premises.

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Hong, 2016 (42)	Observational retrospective study e	4	Assess the in fluency of res volume so many horns net lower on the symptomatology of SNV patients.	34 patients SNV (tic diagnosis established on a concordant symptomatology in patients with a history of turbinectomy partial or total lower objectified by endoscopy of the fossae na dirty) compared to 10 control patients (treated for pituitary adenomas).	Scan of ifs bares used to calculate volume lower turbinates laughing. Calculation in series of volumes anterior and posterior cor sharp (the boundary between anterior and posterior being defined by a line passing through the natural ostium maxillary sinus lar). SNOT-25 score. Study of correlations by test of spearman	Lower turbinate volumes laughing: - total: 1.81 ± 0.92 mL in SNV *versus* 7.35 ± 1.28 mL in the con group (p < 0.001); control - anterior: 0.68 ± SNV 0.42 mL in *versus* 3.63 ± 0.80 mL in the control group (p < 0.001); - posterior: 1.13 ± 0.56 mL in SNV *versus* 3.72 ± 0.56 mL in the control group (p < 0.001). Correlation between SNOT-25 And volume turbine. Lack of correlation between total SNOT-25 score and vo lumes of the inferior turbinates (total, anterior and posterior). Correlation between high score drought and small total turbinal volume (r = - 0.327, 0.030). p = Correlation between pain fa and small anterior turbinal volume (r = -0.392, p = 0.011). Correlation between small posterior turbinal volume and	A small turbinal volume is significantly correlated with certain items specific to the SNOT-25 score such as nasal dryness, thick rhinorrhea, and facial pain.

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						postnasal drip (r = 0.299, p = 0.043), thick drip (r = 0.347, p = 0.022), and dryness (r = 0.288, p = 0.049).	
Konstantidi nis, 2011 (17)	Observational prospective study e	4	Assess if the alteration function nasal trigeminal tion contribute to sensation obstruction nasal paradox in the SNV, in comparison sound with healthy subjects and subjects with	21 patients SNV after turbinectomy subtotal +/- septoplasty. 18 patients who have been operated on for a turbi nectomy subtotal +/- septoplasty but without to have developed lopped by SNV (ITR group).	Trigeminal function assessed by lateralization test menthol (40 stimuli (20 per nostril) for each subject). Olfactometry. Rhinomanome sort. Self evaluation subjective of ol faction and obs nasal destruction.	Trigeminal test (score out of 40): significantly lower results in SNV subjects (21.8 ± 3.5) than in ITR subjects (29.8 ± 3.2, p = 0.021) and healthy subjects (34. 5 ± 3.5, p = 0.004). No significant difference between ITR subjects and healthy subjects (p 0.067). Olfactometry: significantly lower results in SNV subjects than in healthy subjects (28.1 ± 3.5 *versus* 35.5 ± 3.2, 0.028). p =	A decrease in tri nasal sensitivity geminal in the SNV could partly explain the paradoxical dirty na obstruction. The inferior turbinate being one of the richest terminal sites trigeminal nerve sounds, subto a turbinectomy tale significantly reduces the number of receptors. The subjective sensation of obstruction

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			turbinecto crumb lower laugh without SNV.	32 topics healthy.		Rhinomanometry: no significant difference.	nasal passage in the SNV is not correlated with the values of the rhinomanometry. There nasal resistance does not reflect the importance of the obstruction nasal felt. A part of this missing information could be obtained by performing trigeminal testing in clinical practice.
Mangin, 2017 **(32)**	Observational prospective study e	3	Determine if the dysp born in the SNV was associated with A hyperventilation syndrome (HVS).	22 VNS patients. 19 turbinecto crumbs. 3 turbine plates.	Nijme gen score (16 items corresponding to the most frequent symptoms of HVS. A score > 23/64 is frequently used as a threshold). Hyperventilation Provocation Test (HVPT). Blood gas. Spirometry. Plethysmogra phy.	17 out of 22 patients presented with HVS (77.3%). Dyspnea was reported by 15 patients (88.2%) in the HVS group versus 2 patients (40%) in the non-HVS group (p = 0.03). 10 of 17 patients (58.8%) in the HVS group had a Nijmegen test against 2 of 4 patients (40%) in the HVS. band No The Nijmegen score had a sensitivity of 59%, a specificity of 60%, and a positive predictive value of	77.3% of SNV patients in this study had hyperventilation syndrome (HVS). HVS is often triggered by psychological stress. Turbinal surgery could be the initial psychological stress causing HVS in SNV patients. A surgery

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				DLCO. In case of HVPT positive, patients benefit were performing cardio-pulmonary tests with measurement of VO2 max and chest X-ray to exclude a differential diagnosis and allow A diagnosis of HVS. In case of negative HPVT, the patients were con non-HVS flabbergasted.	83% for the diagnosis of HVS. Patient-reported dyspnea had a sensitivity of 88%, a specificity of 80%, and a positive predictive value of 93% for the diagnosis of HVS.	excessive turbinal leads to a fall resistors na dirty, leading to dysfunction of the respiratory system at the alveolar level (disruption of gas exchange) which could lead to HVS. Extensive turbinate surgery results in would also alter the termi nervous houses present in the nasal mucosa and responsible for bronchoconstriction reflex when inhaling cold air, possibly responsible for the appearance of an HVS. The search for a HVS should be offered to patients SNV, with a view to improving

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							their quality of life after respiratory rehabilitation if an HVS was present.
Manji, 2019 (48)	trans study ob versale service e	4	Study the impact of the cli factors matic lo Calcs on incidence and the sap ity of the SNV. Diagnosis of SNV on a score ENS ÿ 11/30 And	53 patients SNV spread over the 5 conti nents in 15 country.	Symptomatology SNV via score ENS6Q. Climate conditions local ticks of the patient's place of residence. Classification of patients according to the Köppen Geiger climate system.	No correlation between se truth of the symptoms to the ENS6Q score and the factors climatic conditions studied.	Study limited by the geographic distribution of the cohort studied (half of the patients residing in North America due to a questionnaire available only in English).

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			antecedent turbine surgery document ted and visible in scanning.				
Christmas, 2019 (46)	Observational retrospective study e	4	Determine if an SNV could on come after medial maxillecto crumb with re section of lower turbinate laughing.	8 patients who have been operated on for a dial maxillectomy complete with resection of the horn lower laughing.	ENS6Q score. Cotton test. Trigeminal function. BDI score *(Beck Depression Inventory).* BAI score *(Beck Anxiety Inventory).*	Average ENS6Q score of 3/30 1. ± No patient improved by the cotton test. At Function average trigeminal bone scored at 30/40 ± 2. Low anxiety scores (BAI) and depression (BDI).	No cases of SNV observed after medial maxillectomy in this cohort.

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Tan, 2018 (45)	Observational prospective study e	4	Assessing the impact of a resection partial cones means on the risk of occurrence of an SNV In THE framework for in the surgical management of rhinos nusites chronicles.	177 patients benefiting endoscopic surgery for rhinosinusitis chronic resistant to a medical treatment optimal dical: - 93 patients with resection partial turbinate means (because Lateral CM his) ; - 84 patients with corn preservation average nets. Mean follow-up 17.9 months.	ENS6Q score. ADSS score *(Adelaide Sun Sease Severity Score).*	Score ENS6Q: - group with partial CM resection: 3.92 ± 4.64; - group without partial CM resection: 3.59 ± 4.46; - no statistically significant difference between the two groups (p = 0.7791). Score ADSS: - group with partial CM resection: 16.1 ± 4.88 preoperatively *versus* 9.25 ± 4.30 postoperatively < 0.0001); (p group without partial CM resection: 15.2 ± 4.83 preoperatively *versus* 8.48 ± 4.03 postoperatively (p < 0.0001); - absence of sta difference statistically significant between the two groups (p = 0.8990).	The authors conclude than partial resection of the turbinates means can be carried out without danger in endoscopic surgeries, particularly in the case of risk of lateralization of the turbinates means.

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Tsarikopoulou, 2015 (20)	Observational retrospective study e	4	Realize of me safe *in vivo* parameters of don't air ment inspired in patients with an antecedent teeth of turbinecto crumb by tielle.	57 patients with history turbi tooth nectomy partial (re deduction of 50% of vo lume), surgery having been performed from 1 months to 17 years ago. 28 topics healthy.	Rhinometry acoustics: temperature measurement perature and humidity in the dirty na pits next to the head of the horn lower net (T2) and the head of the medium turbinate (T2). Endoscopy of the nasal cavities: NOSE-score.	Significantly lower temperature at both detection sites in the post-turbinectomy group compared to healthy subjects: : - T1 (°C): 27.76 ± 2.09 in healthy subjects *versus* 24.15 ± 2.38 post-turbinectomy (t = - 6.968, p < 0.001); - T2 (°C): 28.82 ± 1.61 in healthy subjects *versus* 23.36 ± 2.55 post-turbinectomy (t = - 10.247, p < 0.001). Absence of sta difference significant for statistically humidity values between the two groups. Absence of sta difference statistically significant for score values NOSE between the two groups. Endoscopies: absence of atrophic rhinitis.	Highlighting of a drop in time 13% perature at the head of the inferior turbinate and 19% at the head of the middle turbinate after turbinectomy. No cli translation nic (absence of atrophic rhinitis, absence of nasal obstruction felt).

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Wu, 2020 (18)	Observational retrospective study e	4	Study historical changes logics of mu queuse na dirty in the SNV.	17 patients SNV (diagnosed on a concordant symptomatology and an antecedent turbinecto bottom crumb or average) undergone rehabilitation surgery compared to 6 healthy subjects (operated for benign pituitary death by trans sphenoidal route).	Biopsy of the inferior horns: - study of several characteristics histopathological ticks; - research of TRPM8 in immu nohistochemistry. SNOT-25, BDI-II, BAI scores (on inclusion and 1 year post-operative).	Compared to the control group, SNV patients had: - more squamous metaplasia (relative risk, RR = 3.54; 95% CI, 1.39-8.96; p = 0.018); - more submucous fibrosis (RR = 11.33; 95% CI, 1.56-82.4; p = 0.008); - a significantly lower number of submucosal glands (SNV: 1.71 ± 1.13; control: 3.17, 0.69, 0.013). ± p = Goblet cell metaplasia observed in six SNV patients, absent in healthy subjects (not statistically significant). Epithelial layer of SNV subjects almost intact, with preservation of hair and goblet cells, with no statistically significant difference in the number of cells between the two groups. In immunohistochemistry, expression of TRPM8	In the SNV, a decrease is observed submucous glands, and an increase in squamous metaplasia and fibrosis submucosa, similar to what is seen in atrophic rhinitis. We observe a dimi nution of receptor expression TRPM8 in the SNV, trigeminal receptors which are notably activated by menthol and responsible for sensation of permeability of the nasal fossae by a phenomenon of cooling of the mu queue. This decrease in their ex pressure could account for trigeminal dysfunction and loss of sensation of air passage and

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						significantly lower in the SNV group than in the control group (SNV: 129.68 ± 56.91; control: 251.67 ± 27.94, p < 0.001).	Obser nasal of the cavity patency vees in the SNV.
Zhao, 2011 (24)	trans study ob versale service e	4	Identify the factors physical and physiological contributing to the sensation permeability of pits na dirty.	44 volunteers without healthy, naso-sinus pathology his, unobstructed na filthy objectified to the rhinoma nometry. Air breathing: - ambient; - dry ; - cold.	Temperature measurement temperature and the degree of humidity of the inspired air. Obsessive feeling nasal destruction felt from - 2 to 10. Rhinometry acoustic. Rhinomanome sort. Trigeminal detection threshold with butanol.	Better sensation of nasal permeability unilaterally and bilaterally with cold air and one-sided with dry air compared to ambient air (p < 0.01) with a greater effect of cold air (p < 0.01). Correlated unilateral and bilateral nasal patency sensation related to the total heat loss (loss of conductive heat caused by the temperature gradient added to the loss of evaporation heat caused by the humidity gradient). by Sensation of permeability	Air temperature affects feel of permeability na dirty. When the temperature is maintained constant, the variation of the humidity rate in significantly affects sensation of permeability na dirty. This shows mucosal cooling (or loss of heat) is involved in the sen nasal cavity patency.

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						unilateral nasal correlated with air temperature and humidity. Multiple regression analysis found that heat loss and butanol lateralization threshold contributed significantly to unilateral sensation rale of nasal patency. Without a derived parameter (heat loss), only temperature and humidity contributed significantly to the sensation of nasal permeability.	
Law, 2021 **(47)**	Observational prospective study e	4	Evaluate the possibilities of occurrence of an SNV in the year born next a resect tion turbid nal two-sided mean.	95 patients treated for rhinosinusitis chronicles with or without polyps, or inverted papillomas sinus ses frontal, having benefited endoscopic sinus surgery (Draf	Postoperative ENS6Q score. Presence of scabs in the nasal cavities during the endosco the latest post-operative pie of the follow-up.	The average ENS6Q score at the last consultation follow-up was 2.1 ± 2.7, and 2.1% of patients had 11. A score ÿ 6.3% of patients presented with scabs during last follow-up endoscopy. None of the patients with an ENS6Q score ÿ 11 showed no scabs on endoscopy.	The authors conclude that the occurrence of VNS after medium turbinectomy is unlikely, at least during the first postoperative year. The two patients with a score ENS6Q ÿ 11 postoperatively both had rhino sinusitis chronic

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				IIB or Draf III) associated with a turbine tomy bilateral total mean. No surgery was not carried out on the inferior turbinates laughing.			with polyps and had benefited from Draf III surgeries. Their score Elevated ENS6Q could also be explained by the symptomatology linked to their pathology and not to a VNS.
Moore, 2001 (3)	Observational retrospective study e	4	Investigate symptomatology, factors etiological and thera may, concerning rhinitis primitive atrophic and second daries.	242 patients suffering from rhinitis atro diagnosis between 1984 and 1999.	Compendium of symptomatology. Endoscopic appearance of the nasal cavities. CT scan sorts out pits nasal. Rhinomanome sort. Microscopic analysis of biopsies of the mucosa of the nasal cavities.	45 primary atrophic rhinitis. 197 secondary atrophic rhinitis including 157 with a history of turbinectomy (110 turbinectomies by tial inferior and/or medium, 47 total lower and averages). Rhinomanometries carried out in 135 patients: identical results between the two groups, average nasal resistance of 0.12 Pa/cm3 / s ± 0.03 Pa/cm3 confirming a large permeability of the nasal cavities.	The author speaks out against resections stretches of fabric turbine.

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					Endonasal biopsies performed in 194 patients, finding squamous metaplasia, glandular atrophy, obliterating endarteritis. 107 patients with bacteriological cultures positive for di-pathogens (K. ozaenae on 48 cultures, towards Staphylococcus aureus, Pro teus mirabilis, Escherichia coli).
					CT scan performed on 158 patients, finding mucosal thickening, hypotrophic turbinal structures.
					Similar treatment in two groups: local application of 80 mg of gentamycin diluted in 1 L of serum rum physiological, punctual systemic antibiotic therapy, local application of glycerine, long-term nasal irrigations with isotonic saline serum.

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Table 3. Pathophysiology; numerical simulation approaches (CFD: *computational fluid dynamics)*

Author, Year, Reference	Type of study	Level of evidence	Population/Method	Settings studied	Results	Discussion/Concluded if we
Balakin, 2017 (22)	ob study service nally	4	An SNV patient having been operated on for a turbinecto inferior crumb by bilateral tial. CFD study of his postoperative CT scan (SNV), compared to the preoperative CT scan (before appearance of the SNV).	Pressure and resistance. *Wall Shear Stress* (WSS). Speed. Temperature. Humidity.	Postoperatively (SNV) compared to the preoperative CT scan, the following were observed: - decrease in the resistance of the dirty To inspiration; - decrease in WSS; - increase in speed and decrease in temperature, the inspired air having to travel a greater distance in the nasal cavities to be warmed; - decrease in relative humidity tive: higher speed of the air flow resulting in less contact time with the mucous membrane of the nasal cavities and therefore humidification less important.	In this SNV subject, it was observed (by comparison with his preoperative scan before SNV) a decrease in nasal resistance and *Wall Shear Stress* as well as drier and colder air reaching the posterior part of the nasal cavity.

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Chen, 2010 **(28)**	ob study service nally	4	Actual live surgeries performed on the scanner of a healthy subject after artificial volume augmentation of the lower turbinate: - 1/3 resection lower turbinate lower ; - resection of the head of the inferior turbinate; - turbinectomy in radical inferior. Comparison with a healthy subject and a subject with a natural obstruction dirty harsh.	Stream lines. Resistors nasal. Speed. Pressure. *Wall Shear Stress* (WSS) or constraint shears is lying.	**Modification of the distribution of the inspired air** In the healthy subject, current lines mainly directed in the middle corridor, without vortex. After partial turbinal resection (lower 1/3 or head of the lower turbinate): flow lines mainly directed in the lower corridor and the lower part of the middle corridor. After total turbinectomy, disorganized streamlines, concentrated in the lower neck. **Reduction of resistances** 0.112 Pa.s/cm3 (dirty nasal obstruction) and 0.032 Pa.s/cm3 (healthy subject) **versus** *0.025* Pa.s/cm3 (resection of the lower 1/3) and 0.026 Pa.s/cm3 (radical turbineectomy). **Decrease of the WSS** Peak measured at the head of the inferior turbinate: 0.89 Pa (inferior turbinate increased in volume), 0.52 Pa (healthy subject), 0.30 Pa (total turbineectomy).	Alterations in CFD parameters after total turbinectomy were similar to those observed in a CFD study on atro rhinitis phic.

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Dayal, 2016 (21)	ob study service nally	4	10 patients presenting with turbinal hypertrophy. Virtual surgery: turbinectomy total mean (TMT), turbinectomy inferior to tale (TIT).	Resistors nasal. Air distribution ins worse. Humidity. Transfer of heat. Area of mucosa affected by the *mucosal cooling effect* (on the fa transfer of ex heat yields 50W/m2).	**Reduction of resistances nasal** 0.23 ± 0.21 Pa.s/mL before *versus* 0.18 ± 0.20 Pa.s/mL after TMT (p = 0.0002) and 0.08 ± 0.03 Pa.s/mL after TIT (p=0.042). **Increase in inspired airflow** 137 ± 30 mL/s before *versus* 153 ± 28 mL/s after TMT (p = 0.001) and 174 ± 30 mL/s after TIT (p 0.0005). = **Modification of the distribution of inspired air** Increased percentage of air flowing in the hallway medium after medium turbinectomy (from 53% ± 9% to 75% ± 7%). ± Increase in the percentage of air in the lower corridor after lower turbinectomy (from 39% ± 10% to 62% ± 20%). **Decreased heating and humidifying capabilities** **cation of the nasal mucosa** 94% ± 6% and 95% ± 5% before *versus*	Lower turbinectomies total values have a greater impact on the modification of nasal conditioning parameters of inspired air than turbinec tomies averages. Despite an increase in nasal airflow, the mucosal area where heat transfer exceeds 50 W/m2 di tiny after lower turbinectomy total. Refresh-sensitive receptors mucosal *cooling effect* would be less stimulated, potentially contributing to the sensation radoxal nasal obstruction.

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			83% ± 8% and 85% ± 7% after TMT and 71% ± 6% and 73% ± 6% after TIT. **Decrease in the mucosal surface concerned by the *mucosal cooling effect*** 49 ± 6 cm2 before *versus* 44 ± 4 cm2 after TIT (p = 0.017).

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Sun, 2013 **(23)**	ob study service nally	4	7 CFD models based on scans ners of healthy subjects. realization of chi virtual surgeries: - turbinectomy in lower radical (ENS-IT); - Radical medium turbinectomy (ENS-MT) compared to healthy models.	Resistors nasal. Speed. Pressure. Stream lines. Air distribution ins worse. *Wall Shear Stress* (WSS) or constraint shears is lying.	ENS-MT: **Reduction of resistances nasal** - 0.0067 ± 0.0059 Pa s/cm3 **Increased air velocity on inspiration and ex piration at the postero superior part of the nasal fossa,** in the region of the sphenopalatine ganglion. Few differences regarding THE others settings. ENS-IT: Modification of the streamlines, appearance of whirlwind formations **(vortices) in the lower corridors.** **Decreased airflow** **in the olfactory cleft :** - 26.27% ± 8.68% on inspiration; - 13.18% ± 7.59% at expiration. **Reduction of resistances nasal : -** 0.0134 ± 0.0100 Pa s/cm3	The crusts observed after inferior turbinectomy could be due to dryness secondary mucosa to observed vortices. The authors explain the paradoxical nasal obstruction by a decrease in speed in the lower passage after total turbinectomy, which would decrease the stimulation of the mecha noreceptors in the nasal mucosa which participate in the sensation of the passage of air. After inferior turbinectomy, the airflow in the olfactory cleft is reduced. The reduction the number of moles olfactory cules reaching the olfactory cleft could explain the anosmia or hyposmia reported in the SNV. Changes to

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				Decrease in WSS and speed in the lower lane **laughing.**	aerodynamic parameters are more important after inferior turbinectomy only after medium turbinectomy. This correlates with the fact that NS symptoms such as nasal dryness, crusting, paradoxical nasal obstruction, hyposmia or anosmia, are more frequently observed in patients after inferior turbinectomy than after turbinectomy. mean. In this study, velocity was increased around the sphenopalatine ganglion in the ENS-MT model, but not in the ENS-IT model. The pain or headaches seem to be more frequently reported by SNV patients after turbinectomy mean than after inferior turbinectomy. Authors

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						hypothesize that this is due to the stimula tion of sphenopalatine ganglion by greater air velocity.

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Li, 2017 (15)	ob study service nally	4	6 SNV patients (turbinectomies or inferior turbinoplasties). Comparison of pre- and post-operative scans. Comparison with 14 healthy subjects.	Resistors nasal. Air distribution ins worse. *Wall Shear Stress* (WSS) or constraint shears is lying. Sort function geminal assessed by late test realization at menthol.	**Reduction of resistances nasal** **Modification of the distribution of inspired air** Postoperatively, the inspired air takes the middle corridor, and not the lower corridor (zero speed). The increase in the cross-sectional area of the lower corridor laughing in postoperative ($p < 0.05$) was paradoxically accompanied by a reduction in the percentage of airflow using the lower corridor ($p < 0.05$). laughing **Decrease of the WSS** Weaker postoperative WSS around the inferior turbinates laughing. **Men's lateralization test tho** Lower detection thresholds in SNV subjects (9.2 ± 4.6) than in healthy subjects (14.8 ± 1.6, $p < 0.005$).	A ventilation diagram nasal passage using mainly the middle meatus could predispose to the development of a VNS after turbinectomy or turbi inferior noplasty. The authors hypothesize that lower turbinate reduction procedures could be performed more safely in patients with a baseline ventilation pattern. nasal passage mainly borrowing the lower corridors. The sensation of obstruction paradoxical nasal formation would be due to a loss of sensitivity associated with a reduction in the mucous face stimulated by *mucosal cooling* (cooling of the mucosa).

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Li, 2018 (16)	Study comparative	4	27 SNV patients compared to 42 healthy subjects.	Resistors nasal. Air distribution ins worse. Stream lines. *Wall Shear Stress* (WSS) or constraint shears is lying. Sort function geminal assessed by late test realization at menthol.	**Reduction of resistances nasal** Resistances lower by 25.7% in SNV subjects than in healthy subjects (p<0.001). **Modification of the distribution of inspired air** Reduced airflow in the lower corridor (25.8% ± 17.6% in SNV subjects *versus* 36.5% ± 15.9% in healthy subjects, p = 0.0003). Increased airflow in the middle corridor (66.5% ± 18.3% in SNV subjects *versus* 49.9% ± 15.1% in healthy subjects, 0.0001). p In healthy subjects, the streamlines < were harmonious distributed between the lower and middle corridors. In SNV subjects, the streamlines were tightly concentrated in the hallway average, to the detriment of the lower corridors. **Decrease of the WSS** In the middle lane: 0.58 ±	In SNV patients, the inspired air mostly took the middle corridors. As a result, the airflow in the necks lower dormice was reduced compared to healthy subjects. This significantly reduces air-mu interactions quesa (WSS) in the lower corridor (about two times less than in healthy subjects). An SNV does not necessarily result from a radical gesture. In this cohort, only 4 of the 27 SNV patients had had a tur total binectomy (2 inferior tur binectomies and 2 turbinectomies averages). All SNV subjects had undergone septoplasty, functional endosco sting or resection of the middle turbinates

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				0.24 Pa in SNV subjects *versus* 1.18 ± 0.81 Pa in healthy subjects, p = 0.014. In the middle corridor: 0.70 ± 0.31 Pa in SNV subjects *versus* 1.20 ± 0.82 Pa in healthy subjects, p = 0.038. **The maximum value of the WSS measured in the lower corridor laughter was significantly correlated with the** Spearman correlation test ENS6Q score, r = - 0.398, p = 0.003. **Nasal resistance was not not correlated with ENS6Q or other scores.** **Men's lateralization test tho** Lower detection thresholds in SNV subjects (10.3 ± 3.9) than in healthy subjects (14.0 ± 1.8, p < 0.0001).	associated with resection inferior turbinates. This association could aggravate the risk of occurrence of VNS. The drop in WSS in the lower corridor was significantly correlated with the ENS6Q score, as well as with the specific items “choking” and “nose feels too open”. These results demonstrate that less air-mu queuse are good, the more the symptomatology is important. new tech turbinal mucosa-sparing effects have appeared, but it is important to preserve the quality of the air-mucosa interactions. Without stimulation by the passage of inspired air, a healthy mucosa might not be

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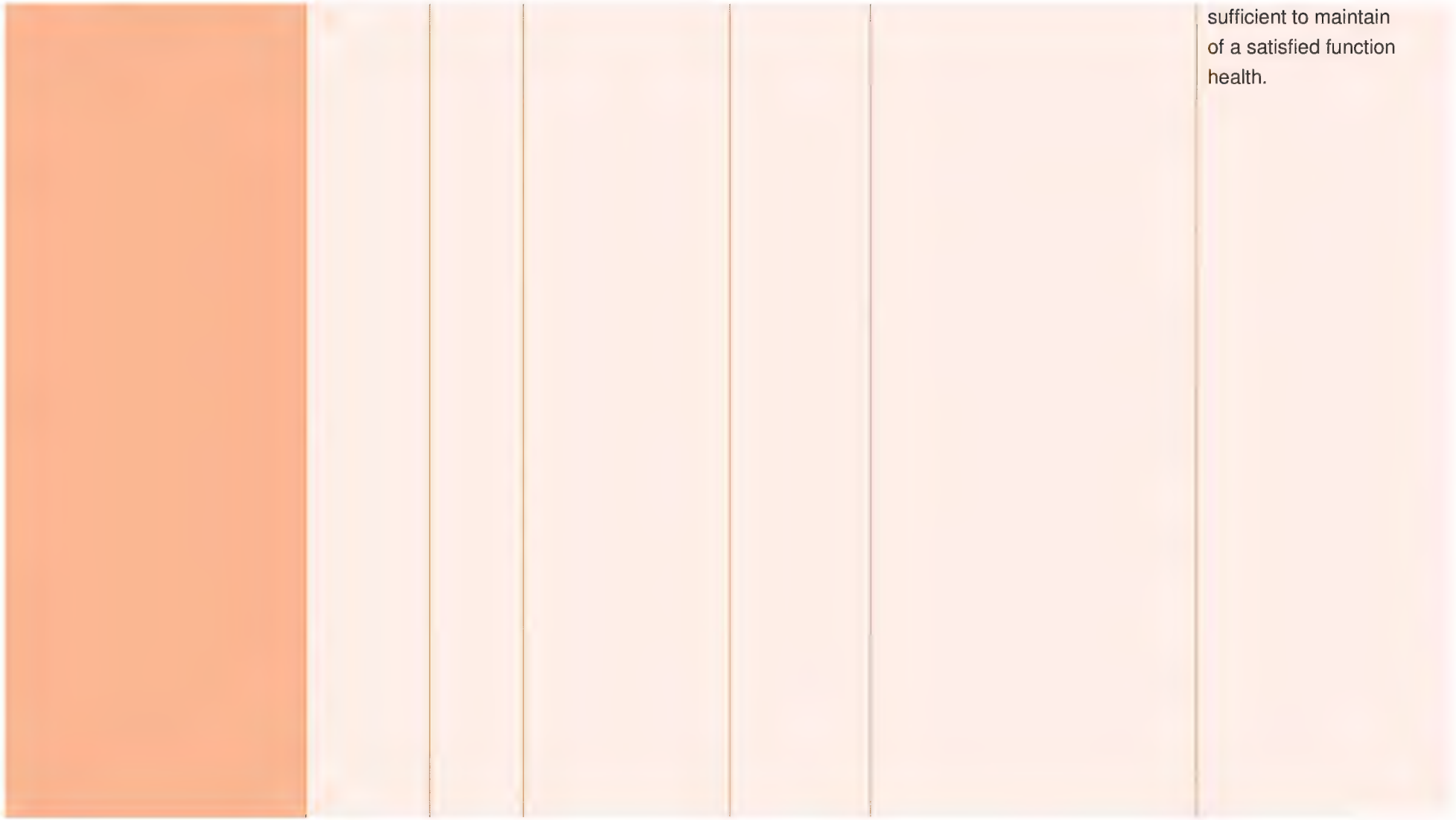

sufficient to maintain
of a satisfied function
health.

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Malik, 2019 **(14)**	Study comparative	4	27 SNV patients compared to: - 42 healthy subjects; - 5 patients with a history of tur inferior binectomy higher without SNV (ITR).	Air distribution ins worse. Areas of section of pits na dirty. Flow, resistances. *Wall Shear Stress* (WSS). Sort function geminal assessed by late test realization at menthol.	**Areas of section** - Larger sectional areas next to the inferior turbinates in SNV subjects and ITR subjects compared to healthy subjects (ITR: 0.94 ± 0.21 cm2 ; SNV: 1.19 ± 1.05 cm2 ; healthy subjects : 0.42 ± 0.22 cm2 p < 0.05), no significant difference between the SNV and ITR , groups. - Larger sectional areas next to the middle and superior turbinates in SNV subjects than in healthy ENS subjects and ITR subjects (SNV: 0.66 cm2 /1.77 cm2 ; healthy subjects: 0.29 cm2 /0, 64 cm2 ; cm2 /0.81 ITR: 0.42 cm2 p<0.05). , **Resistors nasal** Reduction of resistances na dirty subjects in SNV and ITR subjects compared to healthy subjects (ITR: 0.051 ± 0.020 Pa s/mL; SNV: 0.052 ± 0.015 Pa s/mL; healthy subjects: 0.070 ± 0.021 Pa s/mL) . No signifi cant difference between the SNV and ITR groups.	In SNV patients, absence of air using the lower corridor, unlike the su healthy jets and subjects having had a lower turbinectomy without having developed SNV (and this while the widening of the lower corridors after turbinectomy was also im wearing only in SNV subjects). The volume of the reduction tion of the inferior turbinates laughing likely to improve nasal permeability or con milking to train the occurrence of VS not known. A modification of the schema nasal ventilation as associated with a loss of sensory function of the nasal mucosa could lead to the appearance of SNV symptomatology.

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Modification of the distribution of inspired air

Significantly lower flows in lower corridors

of SNV subjects than in healthy subjects and ITR (SNV: 3.69e-5 m3 /s ± 2.58e-5; ITR: 6.96e-5 m3 /s ± 4.12e-5; healthy subjects: 5 .21e-5 m3 /s ± 3.60e-5; $p < 0.05$).

Decrease of the WSS

WSS lower in lower lanes in SNV subjects than in healthy subjects and ITR.

Men's lateralization test tho

Lower detection thresholds in SNV subjects (10.2 ± 3.87, $p < 0.0001$) than in ITR subjects (15.2 ± 1.23) and healthy subjects (14.8 ± 1, 59).

The authors estimate that numerical simulation of flows and menthol *testing* could be used as diagnostic tools in the future.

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Malik, 2020 (65)	ob study service nally	4	6 SNV patients (ENS6Q score > 11 and reduced by 7 points by the cotton test). For each patient, CFD comparison of two scanners: - basic sinus scanner; - sinus re scanner made after placing a cotton pad in the lower corridor laughing labeled with io hexol.	Resistors nasal. Air flow. Air distribution ins worse. gradient of pressure.	Cotton placed 1.74 ± 0.26 cm on average from the posterior edge of the nostrils, measuring on average 1.93 ± 0.35 cm long. Significant improvement in the ENS6Q score after placement of cotton, from 16.8 ± 4.17 points to 3.1 ± 2.4 points ($p < 0.001$). Significant increase in nasal resistance after placement of cotton from 0.12 ± 0.07 to 0.15 ± 0.07 Pa.s/mL ($p < 0.05$). After placement of the cotton, decrease in the air flow in the mean corridor from 83.3 ± 38.8 to 48.6 ± 30.5 mL/s, $p < 0.05$). Change in trajectory of inspired air from the middle aisle to the lower aisle. Before insertion of the cottons, sudden drop in pressure around - 10 Pa after passage of the nasal valve, pressure which then continues to decrease to the posterior part of the pits	Placing cotton in the hallways lower passages makes it possible to modify the nasal ventilation parameters, approaching those of healthy subjects (in particular, better distribution of the inspired air between the lower and AVERAGE).

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					nasal. After insertion of the cottons, the pressure gradient became smoother and more linear all along the nasal cavity.

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Maza, 2019 (26)	Study comparative	4	4 patients who underwent endoscopic surgery of the base of the skull (upper and middle turbinectomy, posterior septectomy and wide sphenoidotomy): - two postoperative SNVs (EEA wENS); - two patients without SNV (EEAw/oENS). Comparison with: - 27 SNV patients post-functional surgery in doscopic (16) non EEA ENS; - 42 *healthy subjects.*	Stream lines. Air distribution ins worse. *Wall Shear Stress* (WSS) or constraint shears is lying.	**Change in the distribution of inspired air** Percentage of inspired air significantly lower in the lower corridor of the two patients with VNS after endoscopic skull base surgery than the two without. EEAwENS: 17.74% ± 4.00 % *versus* EEAw/oENS: 51.25% ± 3.33%, p < 0.002. EEAwENS and not EEA ENS: streamlines *mainly* distributed in the middle corridor, to the detriment of the lower corridor. EEAw/oENS: re *streamlines* parts in the two lower and middle corridors, as in healthy subjects. **Decrease of the WSS** EEAwENS: 0.30 ± 0.13 *versus* EEAw/oENS: 0.61 ± 0.03, p = 0.003).	Study limited by the small size of the population studied. Venti diagrams very different nasal lation rents were found in patients who underwent identical procedures, differences correlated with the occurrence or not of an SNV. One factor to consider is that both EEAwENS patients had a history inferior turbinoplasty. The ventilation diagram Nasal tion of patients SNV is similar, regardless of the procedure (functional surgery or surgery). gie of the base of the skull), and different from healthy subjects or from EEAw/oENS subjects.

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Na, 2012 **(84)**	ob study service nally	4	Actual live surgeries performed on the scanner of a healthy : subject - artificial resection head sky horn lower (model N-I1); - 1/4 resection lower turbinate lower (model N-I2); - subto resection lower turbinate laughing (model N I3).	Air distribution ins worse. Transfer of heat. Temperature.	Modification of the distribution of the inspired air, which borrows more the lower corridor after lower turbinectomy, with reduction of the air flow in the olfactory cleft. Reduced heat transfer their in the NI-3 model (from 2.65 W in the normal model to 2.487 W in this model). Negligible changes in the other two models. Temperature in the cavum lower in the NI-3 model than in the normal model.

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Siu, 2020 (27)	ob study service nally	4	8 patients to be operated on with turbinal surgery +/- associated with septoplasty. Virtual surgery for each patient simulating: - a turbinectomy total lower; - lower turbinoplasty. Comparison with two healthy subjects.	*Wall Shear Stress* (WSS) or constraint shears is lying. Stream lines. Resistors nasal. Pressure. Speed.	After turbinoplasty, reduction of the turbinal volume on average by 47% (from 34 to 66%), and reduction of the surface in average of 24% (from 11 to 40%). **Modification of the distribution of inspired air** The airflow in the corridor in was greater after virtual surgery than preoperatively: 7.1 L/min preoperatively *versus* 9.2 L/min after turbinoplasty (p = 0.04) and 10.6 L/min after turbinecto (p = 0.001). mie After surgery, airflow directed downwards, and decrease in the total air reaching olfactory cleft. **Vortex formations** **(vortex)** in the lower corridors after turbinoplasty and after turbinectomy. **Decreasing the pressure gradient** Pressure gradient (between nostrils and nasopharynx) lower after turbinal surgery than preoperatively: 11 Pa in	The air conditioning profile after turbinoplasty was closer to that of healthy subjects than after total turbinectomy.

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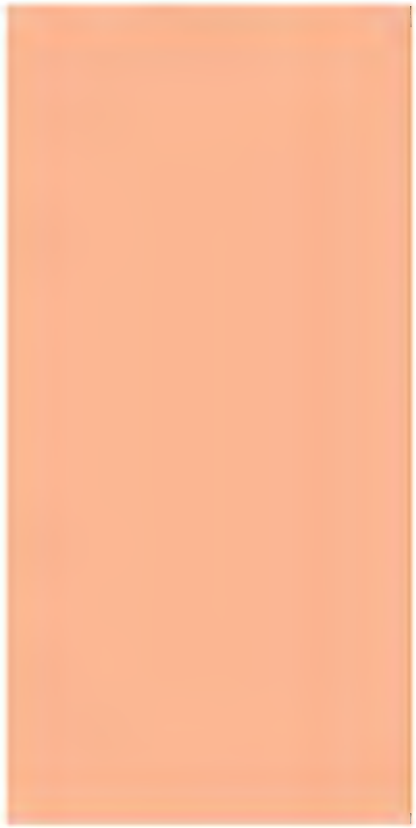

preoperative *versus* 9.2 Pa after turbinoplasty and 7.9 Pa after turbinectomy, p < 0.0001.

Decrease of the WSS

WSS lower in the lower corridors after total turbinectomy than preoperatively: 0.040 Pa *versus* 0.057, p = 0.04.

No significant difference in WSS after turbinoplasty.

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Sullivan, 2014 (25)	ob study service nally	4	Out of 40 patients operated on for nasal obstruction (reduction +/- septoplasty turbid nal), : selection of 10 patients with no no difference in wall thickness lower of the turbinate queuse between scanners pre and post-operative to eliminate the confounding factor of the nasal cycle. Comparison of pre- and post-operative scans.	Score NOSE. VAS score feeling permeability pits nasal. Transfer of heat studied in CFD. Study of correlations between the re CFD results And THE cli scores fuck.	Decrease in NOSE score by 74 ± 18 preoperatively to 25 ± 24 postoperatively (p = 0.0006). Increase in VAS score from 3.0 ± 1.1 preoperatively to 7.3 ± 2.6 postoperatively on the most obstructed side (p = 0.001). In postoperative: - significantly increased heat transfer on the side which was more obstructed (p < 0.0002), unchanged on the side which was less obstructed; - significant increase in the surface of the nasal mucosa with heat transfer > 250 W/m² on the side that was most obstructed, arbitrarily defined as the stimulus threshold tion of the thermoreceptors of the nasal mucosa. This results in an increase in the mucosal surface stimulated by the phenomenon of *mucosal cooling* from 15% preoperatively to 28% postoperatively. in The best observable correlation was the one between the score NOSE and the surface of mu queuse stimulated by a	A significant increase in mucosal *cooling* is correlated with improvement of the sensation of permeability of the fossae na dirt obtained after nasal obstruction surgery.

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					heat transfer > 50 W/m² (r = -0.76, 95% CI [- 0.9; - 03.47], p = 0.05).	

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Table 4. Articles on the different turbinoplasty techniques

Author, Year, Reference	Type of study	Level of evidence	Objective	Population	Disease/Pheno led/ Studied event die	Results	Discussion
Acedevo, 2015 (52)	Meta analysis of randomized comparative trials	1	Systematic Literacy Review deletion concerning the results of bilateral lower turbinoplasties at the micro debrider or by radiofrequency.	26 items included. Prospective studies, including 12 randomi see. 3 studies in blind about the surgical technique. Median tracking 6 months, on average: 14 months [2-60 months].	obstruction nasal passage, assessed by visual analogue scale (VAS; 0-10).	Subjective improvement of nasal obstruction of 4.26 points after inferior turbinoplasty. Absence of significant difference between radiofrequency (+ 4.53 points, 95% CI = 3.52-5.55, p < 0.001, k = 13 studies) and micro debrider (+ 3.81 points, 95% CI = 1, 72-5.91, p < 0.001, k = 8 studies). Significant improvement in acous rhinomanometry scores tick, flow rates and nasal tances resistances. Two studies directly comparing the two methods, one of which randomized, in favor of the micro-debrider technique.	Equivalent efficiency of the two technologies fuck. Interest in studying with a longer-term follow-up.

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Batra, 2009 (85)	Review literature systematic	4	Systematic review of the literature regarding the effectiveness of chi urge in the treatment of symptomatic lower turbi nal hypertrophy.	96 items included. The majority of level 4 (75) or 5 (18). A study of ni calf 1 and two nor studies calf 2. Median tracking 18 months [6-159 months].	will improve tion of quality of life, symptoms and/or objective parameters. Surgical techniques studied: - turbinectomies (partial or total); turbinoplasties (resection - under mucous membrane chopexy, outfracture, microdebrider); - thermal technique (electrocautery, cryotherapy, radiofrequency); - laser.	Benefit of surgery with subjective symptom improvement ÿ 50% in 93 of 96 studies. One study showed no benefit from surgery. Two studies have reported negative effects of surgery: - Moore *et al.* reported improved ventilation in only 27% of patients after turbinectomy, while dryness and crusts were present in 89% of patients. - Warwick-Brown and Marks have been performed partial turbinectomies, submucosal diathermy and cauterization in 207 patients. Symptom improvement was reported in only 39% of patients at 2 years, with 52% of patients suffering from dryness and crusting. of Both of these studies represent data from the mid-1980s.	The turbinecto crumb (partial or total) represented the technique choice during the years born in 1970 and 1980, representing respectively 67% and 52% of studies. More recently the tur binectomy has returned to less popularity with the introduction of new old techniques, representing only 24% and 14% of studies in the years 1990 and 2000 respectively.

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Kavin Ku **Tue, 2019 (50)**	Essay randomized comparative	2	Compare the efficiency of the turbi inferior noplasty and turbinectomy lower partial.	60 patients with rhinitis hypertrophic chronicle. Randomized into 2 groups: - group A: lower turbinoplasty (out fracture and re section bone seuse and under mucosa partial) ; - group B: turbinectomy lower by tial. Followed both hands up to 6 months after surgery.	Score SNOT-22 at D7, D15, M3 and M6 post-operatively. Endoscopy of the nasal cavities.	Significant decrease in postoperative SNOT-22 score in A (mean ± standard deviation): 37.43 ± 2.515 band preoperatively *versus* 22.53 ± 1.833 on D7 postoperatively ($p < 0.001$) *versus* 20 ± 2.244 on D15 post-operative ($p < 0.001$) *versus* 5.07 ± 1.081 at 3 months post-operative ($p < 0.001$) *versus* 5.17 ± 1.02 at 6 months post-operative ($p < 0.001$). Significant decrease in score Postoperative SNOT-22 in the group B (mean ± standard deviation): 38.23 ± 2.417 preoperatively *versus* 32.17 ± 1.653 on postoperative day 7 ($p < 0.001$) *versus* 26.9 ± 2.51 on postoperative day 15 ($p < 0.001$) *versus* 9.8 ± 1.472 at 3 months postoperative ($p < 0.001$) *versus* 14.57 ± 3.759 at 6 months postoperative ($p < 0.001$). Significantly greater reduction in the postoperative SNOT-22 score in group A than in group B at D7, D15, 3 and 6 months postoperatively ($p < 0.001$). Persistence of crusts and rhi norrhea in 13% of patients in the crumb	Improvement clinically more important (score SNOT-22) after turbinoplasty than after turbinectomy. Greater morbidity after turbinecto than after turbinoplasty (crusts, rhinorrhea).

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					group B at 6 months, absent in group A (p = 0.03). Statistically signifi cant difference in the proportion of patients maintaining nasal obstruction postoperatively with better results in group A than in group B (no values reported).

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Mirza, 2020 (53)	Meta analysis of randomized comparative trials	1	Compare the efficiency of the turbi microdebrider inferior noplasty and X-ray inferior turbinoplasty frequency.	In inclusion of 7 hiking tests wagered.	obstruction nasal passage, assessed by scale visual analog gic (VAS; 0-10) at 3-6 months, 1 year and 2 years after surgery. Rhinomanometry, acous rhinometry tick.	Significantly greater improvement in nasal obstruction after microdebrider than after radiofrequency (VAS, from 0 to 10). At 3-6 months: mean difference: - 0.873, 95% CI = - 1.619; - 0.126, p=0.022. At 1 year: mean difference: - 2.420, 95% CI = - 4.123; - 0.718, p = 0.005. At 2 years: mean difference: - 6.700, 95% CI = - 7.021; - 6.379, p<0.001. Anterior rhinomanometry: no significant difference at 3-6 months. Significant difference at 2 years in favor of the microdebrider: different mean ence - 0.014, 95% CI = - 0.034; 0.006, p=0.167. More frequent complications in the microdebrider group than in the radiofrequency group (bleeding).	Better efficiency long-term effectiveness of the microdebrider than radiofrequency, but more frequent complications.

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Neri, 2013 (54)	Prospective observational study	4	To investigate whether mechanical damage to the nasal mucosa during microdebris turbinoplasties were followed anatomical and functional recovery.	13 patients suffering from obs nasal destruction chronic related to a lower turbinal hypertrophy re drug resistant dical and american improved significantly after application of vasoconstrict local tors. Construction of a turbine plasty lower bilateral to microdebris deur (resection of the mucosa and ca bodies vernous, con serving the bone turbine and the periosteum, medial and lower cones in lower), then dabs lies of the	Endoscopy magpie nasal. Obstruction na dirty, assessed by visual scale analog (VAS; 0-10). Clear time rancid mucosa binder. Rhinomanometry. Turbinal mucosa biopsies observed in mi scanning electron croscopy. Before and at 4 months after surgery.	A postoperative complication (bleeding that required anterior nasal tamponade). No complications such as scabs, synechiae, mucosal erosion. Mucosal healing observed macroscopically 4 months postoperatively. Significant improvement in postoperative nasal obstruction. Preoperatively: VAS = 7-10 for 13 patients out of the 13 studied (mean score of 8.69). Postoperatively: VAS = 4-6 for 3 patients and VAS = 0-3 for 10 patients (mean score of 1.77) ($p < 0.001$). Significant decrease in mucociliary clearance time from 17.5 minutes to 11.3 minutes in ($p < 0.001$). mean In rhinomanometry, significant decrease in nasal resistance. In electron microscopy, 4 months postoperative, observation of respiratory mucosa with different degrees of difference cation.	Authors believe that mucosal necrosis induced by ther methods mics represents an obstacle for mucosal regeneration. To obtain a physiological regeneration of the nasal mucosa, an injury of the mechanical type is necessary. Mucosal and submucosal resection serving the periosteum leads to structural regeneration and function mucous membrane.

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			pits dirty.	n / A		

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Sinno, 2016 (51)	Review literature systematic	4	Realize a systematic review of surgical techniques for inferior turbinate hypertrophy.	58 items included.	Occurrence of complications.	Total turbinectomy (7 patients): studies/644 - improvement in nasal obstruction for 79% of patients; - complications: scabs (21%), posterior rhinorrhea (19%). Partial turbinectomy (12 studies/1,136 patients): - improvement in na obstruction dirty for 71.3% of patients; - complications: scabs (20%), posterior rhinorrhea (11%). Resection submucosa: with cold instruments (4 studies/1,161 patients): - improvement in na obstruction dirty for 52% of patients; - complications: scabs (12.3%), bleeding (10%); with a microdebrider (5 studies/1,012 patients): - 61.5% reduction in symptoms of nasal obstruction (4 studies); - improved na obstruction dirty for 91.2% of patients (one study); - complications: posterior rhinorrhea (10%), synechiae (6.7%). Electrocautery (8 patients): - improvement of obstruction na studies/1,231 dirty for 67.3% of patients; - complications: posterior rhinorrhea (33.9%), scabs (23.3%). Laser (16 studies/1,450 patients): - improvement in na obstruction dirty for 74.2% of patients (13 studies);	The main complications reported after turbinectomy were scabs and of the bleeding. Electrocautery had the highest percentage of crusting and postnasal drip complications. Cryotherapy, radiofrequency and laser techniques had a lower complication rate. The restoration of the mucociliary clearance and secret functions tory was observed only after submucosal resection. For the authors, the techniques of submucosal resection and radiofrequency are those which provide the best results in long term, preservation of the tur function binary and a low rate of complications.

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					- complications: rhinorrhea (20.8%), posterior rhinorrhea (11.4%). Cryotherapy (4 studies/851 patients): - improvement of the obstruction na dirty of 69%; - complications: post rhinorrhea (13.8%), higher bleeding (5.2%). Radiofrequency (21 studies/1,515 patients): - improvement in na obstruction dirty for 85.5% of patients (5 studies); - average reduction of 48.9% in the nasal obstruction score (12 studies); - complications: bleeding (7.2%), postnasal rhinorrhea (3.3%); - long-term efficacy (> 30 months).	

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Table 5. Articles related to the diagnosis of VS

At tor, Year, Ref ence	Type of study	Level of evidence	Objective	Population	Disease/Phenomenon/ Event studied	Results	Discussion
Gil, 2020 (70)	Review systematics of literature ture	4	Assess and Challenge cancel the modali SNV diagnostic tests.	CT scans of SNV patients (diagnosed on a history of turbinal reduction, ENS6Q score, and a positive cotton test) compared to CT scans of patients with a history of turbinal surgery without SNV, and to healthy subjects. 32 nasal cavities.		14 studies included. **Two validated tools to aid in the diagnosis of SNV** **1. Self-questionnaire ENS6Q** score ÿ 11 (and especially > 15) in favor of the diagnosis of NSV. **2. Test At cotton** Aid in the diagnosis of SNV (improvement with cotton). Identification of patients who might benefit from turbinate augmentation surgery. **Three interesting tools but still presenting insufficient evidence to be routinely recommended as part of the diagnostic work-up 1. CT scan of the sinuses** Measurement of small turbinal volume and thickening of the septal mucosa in SNV patients. **2. Numerical simulation of flows** Modifications of SNV ventilation and conditioning parameters. nasal In THE Can be useful to affirm an SNV in difficult cases Or doubtful. **3. *Testing* of trigeminal nerve function** Impaired trigeminal sensory function may contribute to the subjective sensation of nasal obstruction. The *testing* of the function of the trigeminal could be useful in pre and postoperative to apprehend the nasal obstruction felt.	

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Proposal of one algorithm diagnostic

Frequent association with anxiety-depressive disorders

Need to assess SNV patients by mental health survey questionnaire +/- assessment

psychiatry in the face of found anxio-depressive comorbidities.

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Tam boo, 2016 (67)	Retrospective study observed tional	4	Assess whether characteristics graphic x-ray ticks could be useful in the development dia ration SNV of diagnosis.	Scans of SNV patients (diagnosed on a history of re turbinal deduction, the ENS6Q score, and a cotton test positive) compared to CT scans of patients with a history of chi turbine surgery without SNV, and to healthy subjects. 32 nasal cavities SNV. 34 nasal cavities with reduction tur Binary without SNV. 58 nasal cavities healthy = control group.	Measures scanogram phics: - : maximum thickness of the mucosa of the inferior turbinate (THIS) ; - greater distance between septum and CI, expensive plane of the nasal cavity and CI, dirty inter-sinus-na septum and CI, and between septum and inter-sinus-na septum dirty ; - greater mucosal thickness of the floor of the nasal cavity, septum and interstitial septum nuso-nasal, to the anterior, middle and posterior part of the na dirty cavity.	Between the SNV and "history of turbinal surgery without SNV" groups: no statistical difference significant concerning the thickness of the mucous membrane of the inferior turbinate, and the distances between septum and CI, floor of the nasal fossa and CI, inter-sinuso-nasal septum and CI, and between septum and inter-sinuso-nasal septum. Between the SNV groups and healthy subjects: significant difference concerning the thickness of the mucosa of the inferior turbinate ($p < 0.01$), and the distances between septum and CI ($p < 0.01$), floor of the nasal cavity and CI ($p < 0.01$), and between septum and dirty intersinusal septum ($p < 0.01$). Absence of significant difference in the distance between the inter-sinuso-nasal septum and CI. Greater thickness of the septal mucosa in the middle and posterior parts of the nasal cavity in SNV subjects, compared to the group "history of turbinal surgery without SNV" ($p < 0.001$) and to healthy subjects ($p < 0.01$) . After - study of the ROC curves: a septal mucosal thickness > 2.64 mm at the central part of the nasal cavity predicts VNS with a sensitivity of 81.25% and a specificity of 67.39%; - a thickness of the septal mucosa > 1.32 mm at the posterior part of the nasal cavity predicts a VNS with a sensitivity of 87.50% and a specificity of 67.39%.	It can be difficult to differentiate SNV patients from non-SNV patients with a history of chi turbinal urge. This study found the existence of specific markers making it possible to differentiate these two groups of patients (thickness of the septal mucosa at the middle and posterior part of the nasal cavity, with cut-off > 2.64 mm and 1.32 mm respectively). The posterior wall of *the agger nasi,* the head of the middle turbinate and the lacrimal tract are constant anatomical landmarks defining the limit between the anterior and middle parts of the nasal fossae.

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Tam boo, 2017 (68)	Study to evaluate of a slide test gnostic	4	Evaluate the vali said of the test at cotton in the diagnosis of VS.	15 VNS patients. SNV of diagnosis on a history of surgery turbinal pain and an ENS6Q score ÿ 11. 18 control patients with naso-sinus a pathology without SNV with an ENS6Q score ÿ 10 (chronic rhinosinusitis, ar nasal obstruction chitectural).	Cotton test: putting in place a piece of cotton (approximately 1 cm wide by 2 cm long) in place of the lower turbinal structure missing upper part (without local anesthesia). ENS6Q score before then 10 minutes after placement of the cotton, then 10 minutes after its removal. Placement and removal of cotton "blind" with false simulations of the insertion and removal with exclusion of patients reporting a modi their ventilation nasal despite the absence of placement or removal of the cotton to limit the placebo effect => no patient was excluded from the study in this context.	Significant differences in the overall ENS6Q score and for each item between the SNV and control groups ($p < 0.001$) before and after placement of cotton: - SNV group: initial mean ENS6Q score of 18.87 ± 7.54 pre-cotton, 6 ± 5.75 cotton *in situ,* and 19.13 ± 7.91 post cotton; - control group: initial mean ENS6Q score of 4.72 ± 3.39 pre-cotton, 5.06 ± 3.94 cotton *in situ,* and 2.94 ± 3.36 post-cotton. Average improvement of 12.86 points in the ENS6Q score of SNV patients with cotton in place. Also improvement in the score specific to each item: " *dryness* ", " *lack of sensation* ", " *suffocation* ", " *nose feels too open* ", " *nasal crusting* " and " *nasal burning* " respectively by 2.13 ± 1.30, 2.66 ± 1.17, 1.60 ± 1.63, 2.06 ± 1.70, 2.26 ± 1.62, and 2.33 ± 1.91. For SNV patients, score changes between pre-cotton and cotton- *in-situ* values were not different from changes between cotton- *in-situ* and post-cotton values for each individual, indicating good reliability and repeatability. of the test. Definition of an MCID score (minimum clinically important difference): including all participants, the mean change in the ENS6Q score between the parameters "a little better" and "unchanged" was 4.25 ± 5.79 and - 2 .00 ± 3.70, defining an MCID score of 6.25.	The cotton test is a validated test to establish the presence of VS. An improvement of ENS6Q score of 7 points is the threshold calculated as clinically significant in the improvement of VS symptoms.

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Velas quez, 2017 (63)	Study to evaluate of a slide test gnostic	3	To validate A diagnostic score specific to the SNV, the ENS6Q questionnaire.	Prospective study case-control: - 15 subjects with SNV (diagnosed on nasal discomfort and/ or an obstruction paradoxical nasal passage despite permeability of the nasal cavities, antecedent of chi turbinate ururgy, a positive cotton ball test); - 30 subjects with chronic rhinosinusitis picnic without polyps; - 30 healthy subjects no history nasal sinus surgery.	ENS6Q questionnaire in 6 items : - *dryness ;* - *sense of diminished na dirty airflow ;* - *choking ;* - *nose feels too open ; nasal* - *crusting ; burning.* - *nasal* Score SNOT-22. 2 questionnaires repeated at 5 intervals. days Measurement of internal consistency by Cronbach's alpha coefficient. Study of ROC curves. Definition of the score that maximizes sensitivity and minimizes the false rate positive.	Internal consistency of 0.93 (95% CI, 0.90-0.95) for ENS6Q and 0.94 (95% CI, 0.94-0.96) for SNOT 22. Significantly higher ENS6Q scores in SNV patients than in patients with chronic rhinosinusitis healthy subjects. Or ENS6Q was superior to SNOT-22 in its ability to discriminate VNS patients from patients with chronic rhinosinusitis and healthy subjects, with an area under the curve of 0.97 (95% CI: 0.93-1.00) versus 0.67 (95% CI: 0.50-0.85) and 0.80 (95% CI: 0.65-0.94) respectively. A cut-off value was determined at 10.5 out of 30. A score ÿ 11/30 reliably predicts the presence of VNS, with a sensitivity of 86.7% and a specificity of 96.6%.	The ENS6Q score is a specific validated tool to aid in diagnosing the SNV.

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Weapon nian, 2021 (69)	Study to evaluate of a slide test gnostic	4	Validate usage tion of the test ENS6Q to differentiate between patients with NSV patients with obstruction primitive nasal passage (linked to a septal deviation and/or inferior turbinal hypertrophy).	15 suffering patients border of SNV (SNV group): diagnosed on nasal discomfort and/or an obstruction paradoxal nasal formation despite permeability of the nasal cavities, a history of chi turbinal urgia, a posi cotton test tif. 30 patients with obstruction primary nasal (PNO group): patients complaining of uni or bilateral nasal obstruction, linked to a septal deviation and/or inferior turbinal hypertrophy, without a history of nasal surgery.	scores SNOT-22. Score ENS6Q. 2 questionnaires repeated 5 days apart. Study of ROC curves.	ENS6Q total score significantly higher in the SNV group than in the PNO group (18.9 ± 7.5 *versus* 8.9 ± 4.1, p = 0.001 during the first collection, 19.5 ± 7.5 *versus* 8, 6 ± 3.9, p = 0.001 during the second collection). Scores for some items were significantly higher in the SNV group than in the PN: " *dryness* ", " *lack of air sensation going through your nasal cavities* ", " *nose feels too open* ", " *nasal burn ning* ". Absence of significant difference between the two groups concerning the items " *suffocation* " and " *na sal crusting* ". Regarding the " *nose feels too open* " item , none of the patients in the PNO group had a score greater than 0. The ENS6Q score made it possible to reliably differentiate SNV patients from PNO patients, with an area under the curve equal to 0.86, with a threshold value established at 12.	Unlike Ve lasquez *et al.* who established a threshold value of 10.5 to discriminate SNV patients from healthy subjects or those suffering from rhinosinusitis chronic, the authors suggest retaining a threshold value of 12 to allow better differentiation between patients suffering from SNV of patients with nasal obstruction related to septal and/or turbinal cause. The authors souli affect the performance of the " *nose feels too open* " item, the score of which was equal to 0 in all patients not suffering from VNS.

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Table 6. Articles on psychological disorders associated with VS

Author, Year, Reference	Type of study	Level of evidence	Objective	Population/Method	Disease/Phenomenon/ Event studied	Results	Discussion
Huang, 2019 (71)	Study prospect objective nal service	4	Study the association communication between the items of SNOT score 25 and severity rite of the year troubles xio-depressive in the SNV, before and after rehabilitation surgical.	68 VNS patients. Diagnosis on symptoms of SNV and CO test your. Submucosal implantation of Med por (floor or partition inter if nuso-nasal).	Score SNOT-25. BDI-II and BAI scores. 1 day before and 6 months after treatment.	**Score BDI-II initial** in mean : 19.3 ± 15.0 48.5% : 0-13 : normal 12.2%: 7.4%: 14-19 : mild depression moderate 30.9%: 20-28 : depression severe depression 29-63 : **Score BAI initial** in mean : 17.7 ± 12.9 26.5% : 0-7 : normal 20.6%: 26.5%: 8-15 : anxiety mild 26.2%: 16-25 : anxiety moderate 26-63 : anxiety severe **Study of the correlations** The BDI-II and BAI scores were significantly correlated with the total SNOT-25 score, and the SNOT 25 items concerning otological and facial symptoms, psychological disorders, sleep disorders, and symptoms specific to empty nose. On the other hand, there was no correlation with the SNOT-25 rhinological items. **After implantation** Improvement of most of the SNOT-25 items except " *nasal crusting* " and " *facial pain/pressure* ". Changes in BDI-II score were significantly correlated with change in total SNOT-25 score and items concerning sleep disturbances and empty nose, but no rhinological symptoms. **Predictive value of SNOT-25 in the detection of a**	Association strong between SNV and anxiety disorders depression: 38.3% moderate to severe depression and 53% of disorders an moderate to dry see in this cohort. Anxiety scores and depression were correlated with sleeping troubles and symptoms of emptiness nose After rehabilitation surgery, the improvement in the score of depression was correlated with regression of sleep disturbances and empty nose symptoms. The authors in con believe that sleep disturbances and empty nose symptoms contribute psychological disorders

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					trouble **anxiety and depression** (ROC curves) AUC > 0.5: total SNOT-25 score (AUC = 0.765, p < 0.001), sleep disorder items (AUC = 0.734, p < 0.001), empty nose items (AUC = 0.819, p < 0.001). Se/Sp optimization: total SNOT-25 score > 60 (Se 84.6%, Sp 61.9%), sleep disorder item score > 18 (Se 73.1%, Sp 66.7%), score items relating to an empty nose > 14 (Se 75%, Sp 81.6%).	frequently found ves in the SNV. An SNOT-25 score > 60, and more specifically a score of disordered items of sleep > 18 and one score of related items empty nose tifs > 14 are predictive of a depressive disorder moderate to severe.

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Kim, 2019 (35)	Study cross dirty ob service nally	4	Compare the degree of depression THE between patients SNV and suffering patients against others naso-sinus pathologies his.	24 SNV patients (group A) diagnosed on symptoms of empty nose and a blood test. cotton positive compared to: - 16 patients with rhinosinus chronic site with polyps (group B); - 20 suffering patients rhinosine fron chronic site without polyps (group VS) ; - 34 patients with rhinitis al ergic (group D).	Score BDI. Score SNOT-22. Nasal endoscopy. Acoustic rhinometry. Cotton test.	Depression in 71% of patients in the SNV group (group A), with varying degrees of severity, significantly higher than in the other groups: 19% in group B, 15% in group C, and 27% in the D. band No significant correlation between nasal cavity volume and BDI score in the SNV group.	Prevalence and severity ity of a depressive syndrome higher in the SNV than in other naso-sinus pathologies. No correlation relationship between the severity of the depression and the volume of the cavities nasal.

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Manji, 2018 (66)	Study cross dirty ob service nally	4	Assess the se truth of the mental health disorders and challenges func tional in the SNV.	53 SNV patients diagnosed with an ENS6Q score ÿ 11 and a history turbinal surgery tooth with a inferior turbinate defect visible on scanner.	Score PHQ-9. Score GAD-7. Score SSE. Score WPAI. EQ-5D-5L score.	**Score PHQ-9 :** in mean : 17.94 ± 6.87 3.9% normal 11.3%: mild depression 16.9%: moderate depression 18.9%: 15-19: moderate to severe depression 49%: severe depression 0-4 : 5-9 : 10-14 : 20-27 : **Score GAD-7 :** in mean : 12.77 ± 5.99 11.3% : 0-4 : regular 22.8%: 16.9%: 5-9 : anxiety mild 10-14 : anxiety moderate 49%: 15-21 : anxiety severe **Score SSE :** in mean : 7.64 ± 6.49 41.5% with score ÿ 8 (threshold value chosen by the authors indicating drowsiness that should suggest a sleep disorder) **Score WPAI :** 62% reduction in productivity at work 65% reduction in ability to participate in other professional activities that **EQ-5D-5L score :** on average: slight mobility problems, no problems with self-care, moderate difficulties with household or leisure activities, moderate level of anxiety and depression. Or of **Study of the correlations :** severity of symptoms with ENS6Q score correlated with high level of depression ($p < 0.001$), anxiety ($p < 0.001$), reduced productivity at work ($p < 0.001$), pain and general discomfort ($p = 0.002$), and discomfort in activities of daily living ($p = 0.003$).	High prevalence of depression and anxiety in the SNV: 68% moderate and/or severe depression and 66% of anxiety disorders mo mild or severe. The severity of empty nose symptoms was proportional to the severity psychiatric disorders.

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Huang, 2022 (72)	Study prospective objective service nally	4	study the association communication between THE scores SNOT-25 and ENS6Q and the severity of year troubles xio-depressive in the SNV, before and after rehabilitation surgical.	74 VNS patients. Diagnosis on the symptomatology and the endoscopic aspect of the nasal fossae, as well as a positive cotton test. Submucosal implantation of Med por (floor or partition inter if nuso-nasal).	Score SNOT-25. BDI-II and BAI scores. Pre-operative data collection and 6 post-operative months.	**scores preoperative** 71.0 : SNOT-25 = 15.9 ± 21.0 ENS6Q = 20.6 ± 5.3 BDI-II = 20.1 ± 14.4 BAI = ± 12.8 **scores post-operative** 37.9 : SNOT-25 = 7.5 ± 24.1 ENS6Q = 8.6 ± 5.2 BDI-II = 10.6 ± 9.4 BAI = ± 10.1 Statistically significant improvement in all (p<0.001). scores in postoperative **Study of the correlations:** strong correlations between preoperative SNOT-25 scores and preoperative ENS6Q (r = 0.682, p < 0.001), preoperative BDI-II (r = 0.485, p < 0.001), and preoperative BAI scores. operative (r = 0.608, p < 0.001). Weak correlations between preoperative SNOT-25 scores and postoperative SNOT-25 scores (r = 0.336, p = 0.004), postoperative BDI-II (r = 0.266, p = 0.022), and postoperative BAI -operative (r = 0.235, p = 0.044). Lack of correlation between SNOT-25 scores and ENS6Q post-operative. Strong correlations between preoperative ENS6Q and preoperative BDI-II scores (r = 0.434, p < 0.001), preoperative BAI (r = 0.521, p < 0.001), and postoperative ENS6Q (r = 0.262) , p = 0.024). Absence of correlations between preoperative ENS6Q scores and postoperative BDI-II and BAI scores. **Predictive value of SNOT-25 and ENS6Q in screening for an anxiety-depressive disorder** (study of ROC curves). Area under the curve > 0.5 for preoperative SNOT-25 score and postoperative anxiety (AUC = 0.695,	The SNOT-25 score preoperative seems better correlated to the postoperative psychological state than the ENS6Q. score SNOT scores 25 > 70 and > 74 are predictive of the presence of disorders respectively anxious and depressive postoperatively.

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						p = 0.016) and moderate to severe postoperative depression (AUC ratory p < 0.001). = 0.789, Optimal threshold value (Se/Sp maximization): SNOT-25 score > 71 predicting moderate to severe postoperative anxiety (Se: 75.0%, bSp: 53.7%) and an SNOT-25 score > 74 predicting moderate to severe postoperative depression (Se: 88.9%, Sp: 63.1%).	

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Huang, 2022 (74)	Study prospective objective service nally	4	Assess the pre valence of the presence of thoughts of suicide daries at THE patients SNV and identi proud of college tors of risk of presence of ideas suicidal at these pa here.	62 VNS patients. Diagnosis on the symptomatology and the endoscopic aspect of the nasal fossae, as well as a positive cotton test. Submucosal implantation of Med por (inter sinuso-nasal partition).	Score ENS6Q. Score SNOT-25. Score BAY. Score BDI-II. Presence of suici thoughts areas assessed by item 9 of BDI-II : 0 I don't think about killing myself at all 1 I Sometimes Think About Killing Myself, But I Won't 2 I would like to kill myself 3 I'd kill myself if given the chance Before and 6 months after surgical reconstruction.	**Presence of suicidal ideation in 23 of the 62 patients SNV included :** 20 patients with a score of 1 (Sometimes I think about committing patients with a score of 2 (I born THE suicide), but I 2 would like to kill myself) 1 patient with a score of 3 (I would kill myself if given the opportunity) to 4 patients had suicidal thoughts after surgical treatment. **Significant differences in SNOT-25 scores, Preoperative ENS6Q, BAI and BDI-II between patients without suicidal ideation and patients with suicidal ideation :** SNOT-25: 66.9 ± 20.7 *versus* 80.8 ± 20.2 (p = 0.041) ENS6Q: 15.3 ± 5.0 *versus* 18.3 ± 4.9 (p = 0.018) BDI-II: 14.7 ± 10.8 *versus* 34.3 ± 13.0 (p < 0.001) BAI: 15.7 ± 10.2 *versus* 30.1 ± 12.3 (p < 0.001) No significant difference in the 4 postoperative scores between THE two groups. **Item " *nose feels too open* " of the preoperative ENS6Q score significantly different between patients without suicidal ideation and patients with suicidal ideation :** 1.3 ± 1.7 *versus* 3.2 ± 2.0 (p < 0.001). No significant difference for the other ENS6Q items. score Use of SNOT-25, ENS6Q, BAI, BDI-II scores, and the **ENS6Q " *nose feels too open* " item** to predict the presence of suicidal thoughts (ROC curves) : AUC > 0.5: SNOT- 25 (AUC=0.657, p=0.029), ENS6Q (AUC=0.681, p=0.009), BAI scores (AUC=0.817, p<0.001), BDI-II scores (AUC=0.884, p<0.001), and " *nose feels too open* " (AUC = 0.745, p < 0.001). Se/Sp optimization: SNOT-25 score > 91 (Se = 34.8%,	Presence of ideas suicidal at the house of 37.1% of SNV patients in this study. These patients had more severe symptoms, impaired quality of life and more significant psychological disorders than patients who did not have suicidal thoughts. SNOT scores 25 > 91, ENS6Q > 15 BAI > 25, and BDI-II > 26 seem predictive of the presence of suicidal thoughts. A score > 3 on the item " *nose feels too open* " of the ENS6Q score was signifi cantly associated with the presence of suicidal thoughts in SNV patients.

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					Sp = 92.3%), ENS6Q score > 15 (Se = 69.9%, Sp = 69.2%), BAI score > 25 (Se = 69.9%, Sp = 82.1%), BDI score -II > 26 (Se = 82.6%, Sp = 84.6%), and item " *nose feels too open* " > 3 (Se = 60.9%, Sp = 87.2%).

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Lamb, 2022 (73)	Study cross dirty ob service nally	4	To study Mental Health patients SNV in com parison with patients suffering from rhinitis or rhi nosinusitis chronic.	58 VNS patients. 58 patients with rhinitis or chronic rhinosinusitis (CRS/CR).	Score ENS6Q. RSDI *(Rhinosinusitis Disability Index)* score . *Obsessive-Com* Score *Pulse Inventory-Revised* (OCI-R). *Patient Health* scores *Questionnaire* (PHQ): PHQ-9, PHQ-7, PHQ-15.	**Score ENS6Q** Mean scores higher in SNV patients: 19.5 (95% CI: 18.41-20.63) than CRS/CR patients: 4.45 (CI 3.66-5.23), p < 0, 0001. **Score RSDI** Mean scores higher in SNV patients: 78.6 (95% CI: 72.8-84.5) than in CRS/CR patients: 18.6-31.8), 25.2 p < (95% CI: 0.0001 . Also significantly higher scores for each subpart of the test (emotional, functional, physical) SNV subjects. **Score OCI-R** Mean scores of SNV and CRS/CR patients < 21 (diagnostic threshold for obsessive-compulsive disorder) with no significant difference between the two groups. **Score PHQ-9 (depression)** Mean scores higher in SNV patients: 15.35 (95% CI: 13.40-17.29) than in CRS/CR patients: 4.24 (95% CI: 2.91-5.58), p<0.05. 28.57% severe depression, 14.28% moderate to severe depression and 38.78% moderate depression in SNV patients *versus* 13.79% moderate to severe depression and 17.224% mild depression in CRS/CR patients . **PHQ-7 score (anxiety)** Mean scores higher in SNV patients: 60 than in CRS/CR patients: 7.02, p < 0.0001. 60% generalized anxiety disorders in SNV patients *versus* 7.02% in CRS/CR patients (p < 0.0001). **Score PHQ-15 (somatization)** Mean scores higher in SNV patients: 53.06 than in CRS/CR patients: 14.04, p < 0.0001. 53% of SNV patients reached the diagnostic threshold	Higher prevalence year of trouble xio-depressive in SNV subjects than in subjects suffering from rhinosinusitis chronic. Impaired quality of life. 53% trouble with somatization in SNV patients.

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somatization disorder *versus* 14% of CRS/CR patients ($p < 0.0001$).

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Tian, 2021 (76)	Study prospective objective service nally	4	Evaluate the effi capacity of a in psychosomatic care in the treatment ment of SNVs secondary to turbines plasties without loss of substance turbi nal objectified.	28 suffering patients border of SNV: - secondary to dirty endona surgeries (si nusian surgeries, polypectomies, tur binoplasties under mucous membranes or by radiofrequency or not coblation, septoplasties); - without loss of cloudy substance nal objectified by endoscopy or computed tomography sort; - with normality of there rhinometry acoustics and rhinomanometry; - with cotton test positive ; - with specific symptoms (ENS6Q and SNOT-25 scores). Psychosomatic care in 4 steps: - construction of a tea relationship rapeutics of mutual trust, making it possible to overcome initial skepticism;	Score SNOT-25. PHQ-15 score *(15-item Patient Health Questionnaire)* for the evaluation of somatic disorders station. PHQ-9 score *(9-item Patient Health Questionnaire)* for the evaluation of depression. GAD-7 score *(Genera lized Anxiety Disorder)* to assess anxiety. Collections at the initial visit, then at 3 and 12 months.	**Score SNOT-25** The mean SNOT-25 score is significantly improved after treatment, going from 64.89 ± 5.02 initially to 46.5 ± 6.34 at 3 months and 21.6 ± 8.07 at 12 months ($p < 0.001$). The 5 most frequently reported items initially were ' *nose is too open* ', ' *waking up at night* ', ' *lack of a good night's sleep* ', ' *difficulty falling asleep* ' and ' *reduced concentration* '. Scores for these 5 items were significantly lower at the 3-month and 12-month visits than at baseline ($p < 0.01$). **Score PHQ-15** Baseline: 6 patients with severe somatization disorder, 11 patients with moderate somatization disorder, and 10 patients with mild somatization disorder. After treatment: significant improvement in the mean PHQ-15 score, from 11.14 (moderate) initially, to 3.07 (normal) at 12 months ($p < 0.0001$). **Score PHQ-9** Initially: 6 patients with moderate to severe depressive syndrome, 13 patients with moderate depressive syndrome, 8 patients with mild depressive syndrome, 1 patient without depressive syndrome. with of After treatment: significant improvement in the mean PHQ-9 score, from 10.64 (moderate depressive syndrome) initially, to 1.96 (normal) at 12 months ($p < 0.0001$). **Score GAD-7** Initially: 11 patients with moderate to severe anxiety disorder, 16 patients with moderate anxiety disorder, 1 patient with mild anxiety disorder. with After treatment: significant improvement in the mean GAD-7 score, from 10.54 (moderate anxiety disorder) initially, to 1.54 (normal) at 12 months ($p < 0.001$).	Patients with VNS type ENS-type (patient with a history of turbinoplasty, without loss of identical turbinal substance tifiable) responding to the diagnosis of somatization disorder can benefi t from psychological care (cognitive behavioral therapy) associated with treatment antidepressant sister.

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			- cognitive therapy to address key dysfunctional beliefs (especially that nasal discomfort was mainly caused via nasal surgery); - behavioral therapy to support certain habits studies such as iterative nose washes; - antide treatment prescribed to treat anxio-depressive disorders.		

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Table 7. Articles on the treatment of SNV

Author, Year, Reference	Type of study	Level of evidence	Population	Treatment studied	Criterion of judgement	Results	Talk/con enclosure
Bastier, 2016 (36)	Study prospective objective service nally	4	14 patients with obstruction nasal paradoxical resistant to several treatments medical: - after lower turbinectomy (10 patients); - after turbinoplas tie (3 patients); - after reduction of turbinal volume by radiofrequency (1 patient).	SINUS-UP implant (Kasios, Lau naguet, France) composed of beta tricalcium phosphate non-porous. Incision vesti bilated bular rale, detachment subperiosteum to the piri and forms positioned under mucosa along the inter septum sinuso-na dirty.	NOSE questionnaire *(Nasal Obstruction Symptom Assessment).* Question nary Rhi noQol *(Rhinosinusitis Quality of Life).* Nasal endoscopy.	Mean follow-up 19.4 ± 13.4 months (3.6-49 months). Disappearance or reduction of the crusts in 5 of the 9 patients who suffered from them preoperatively. Exposure of material observed in a patient, without infectious complications or extrusion. Absence of complication on the tear pathway. 2 nd intervention necessary at two patients (one patient feels a decrease in comfort nasal after two years post-operative requiring the replacement of the implant for a more voluminous implant, a patient presenting implants initially badly positioned having required their replacement in good position). NOSE: total score 73.93 ± 21.85 preoperatively *versus* 34.64 ± 28.59 postoperatively	THE B-tricalcium phosphate seems to be an interesting option in micro endonasal plasty, because it has good tolerance and stable results long-term.

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					(p=0.001). RhinoQol *frequency :* total score 44.64 ± 17.14 preoperatively *versus* 34.82 ± 20.32 postoperatively (p = 0.007). RhinoQol *bothersomeness :* total score 43.57 ± 22.44 preoperatively *versus* 70.71 ± 21.53 postoperatively (p = 0.005). RhinoQol *impact :* total score 59.92 ± 21.15 preoperatively *versus* 27.18 ± 25.3 postoperatively (p = 0.001).

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Borchard, 2019 (57)	Study prospective objective service nally	4	14 patients included between July 2014 and May 2018. Patients complained of obstruction nasal paradoxical, had a history of turbinectomy with less turbinate tissue loss on clinical examination, an ENS6Q score *(Nose Syndrome 6- item Questionnaire)* ÿ 11 and a test at positive cotton.	Carboxymed ethylcellulose/ glycerin gel (Prola ryn® , Merz, Raleigh, NC). Multiple injections to the anterior part of the pit floor na dirty and internal partition sinuso-na dirty, depending on the loss of tissue and result from the test to the co your. Between 0.4 and 0.8 mL were injected in 4 or 5 injections per side.	ENS6Q, SNOT-22 *(22-item Sino-Nasal Outcome Test),* GAD-7 *(Generalized Anxiety Di sorder 7- item Scale),* PHQ-9 *(Pa holds Health Questionnaire-9).* Collections at a to maine, 1 month and 3 postoperative months.	The mean ENS6Q score was reduced after injection: 20.8 ± 4.9 : preoperatively, 10.5 at one week postoperatively (p < 0.0001), 13.7 at one month postoperatively (p = 0.0023), 15.5 to 3 months postoperatively (p > 0.05). The mean SNOT-22 score was reduced after injection: 50.3 ± 15.2 : preoperatively, 29.3 at one week postoperatively (p = 0.01), 35.5 at one month postoperatively (p = 0.04), 39.3 at 3 months postoperative (p > 0.05). The GAD-7 score was reduced after injection 8.6 preoperative, : 5.4 at one week postoperative (p > 0.05), 4.9 at one month postoperative (p = 0.02), 5 to 3 months postoperative operative (p = 0.02). The PHQ-9 score was reduced after injection :	CMC/glycerin gel is an interesting choice health of a temporary implant due to its resorption after 2 to 3 months and its good tolerance. The limits of sound use are the li volume mimic that can be used, the imperfect control of the modification provided, and its resorbable nature. Its easy to use under anesthesia lo hold in an outpatient procedure East interesting to rapidly improve the symptoms of patients awaiting a longer lasting implant surgery.

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					11.6 preoperative, 6.6 at one week postoperative (p = 0.01), 7 at one month postoperative (p = 0.004), 7.9 at 3 months postoperative (p > 0.05).	No complications.

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Fu, 2019 (33)	Study prospective com comparative no ran domesticated	4	19 VNS patients. Diagnosis of SNV based on clinical signs, a history of turbinectomy, and a positive cotton swab. Comparison with 12 patients suffering from hypertrophic chronic rhinitis, benefiting from a turbinoplasty.	Medpor submucosal implant.	Score SNOT-22. BDI score II. BAI score. nNO *(nasal nitric Oxide)* (comparison with a group of healthy subjects). Measures to 3, 6 and 12 months postoperative.	scores pre-operative : SNOT-22 similar for both groups. ENS: 65 (14-88) *versus* CHR: 51 (12-74), p = 0.156. BDI-II and BAI significantly higher in SNVs. BDI-II: ENS: 15 (5-52) *versus* CHR: 8 (0-18), p=0.007. BAI: ENS: 21 (1-42) *versus* CHR: 2.5 (0-26), p=0.005. nNO: - pre-op: significantly lower in SNV than in CHR (p = 0.015); - post-op: SNV: significant increase from 3 months post-operative then stable (p = 0.015). unchanged. CHR : Persistence of nNO lower in SNV than in CHR postoperatively (p = 0.001). Significant improvement in postoperative SNOT-22 scores in SNV and CHR from 3 months postoperatively (p < 0.001). Significant improvement in BDI-II and BAI scores post	The level of nNO in the nasal mucosa could be the first objective parameter to assess the results of d surgical accreditation from the SNV.

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					surgery in SNV from 3 months post-surgery (p<0.001). In SNVs, correlation between increased nNO and improved BDI-II and BAI scores after surgery (p = 0.025 and 0.035) but not with the SNOT-22 score. In CHR, correlation between the increase in nNO and the SNOT-22 score (p = 0.004) but not the BDI-II or BAI scores.

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Houser, 2007 (8)	Study prospective objective service nally	4	11 SNV subjects included but 3 lost seen. SNV diagnosed on symptomatology (paradoxical nasal obstruction, dyspnoea, dryness, often depression) and physical examination. The patients were classified into 4 categories gories: - ENS-IT (total or subtotal inferior turbinec tomy); - ENS-MT (total or subtotal medium turbinec tomy); - ENS-both (complete or partial resection of the lower and middle turbinates); - ENS-type: patients with a history of turbinectomy, presenting SNV symptoms which improve with	Acel dermis lular (AlloDerm; LifeCell; Branchburg, NJ). For ENS patients type: implant submu tail in the lower turbinate laughing. For ENS patients MT: implant placed in under the perichondrium and subperiosteum and sutured to the septum na sal next to the loss of substance of the horn AVERAGE. For ENS patients IT: implant placed on the	Score SNOT-20 to 3 and 6 months post-operative.	Follow-up between 6 months and 4 years depending on THE patients. No new symptoms developed after implantation. SNOT-20 values for depression (sadness, irritability, sleep disturbance) tended to improve After implantation. The mean SNOT-20 score before *versus* after implantation was 58.3 (16.6 SD) *versus* 38.3 (17.4 SD) (p ÿ 0.02). 2 patients had minor implant exposure within the first two weeks, but healing then proceeded uneventfully. what nor infection.	It is essential to carry out a cotton test before im planting. The pain is the least improved symptom by rehabilitation surgery.

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		cotton test, in which na dirty endoscopy does not show any loss of substance turbi end. Before implantation, all the patients benefited from a trai ly medical with humidification maximal mucosa, continued post-operatively. Surgery was only considered after a one-year follow-up after any turbinal surgery. A cotton test was used to define the best size and the best positioning of the implant.	septum or on the dear plane of the nasal cavity next to the head of the horn lower net missing, doing at try not to not obstruct the ostium of the male lacrimal pathway. Vo lights implanted depended on the volume of man fabric regarding the results of the cotton test.		

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Huang, 2020 (37)	Study prospective objective service nally	4	54 SNV patients who underwent endonasal microplasty between 2015 and 2018. SNV diagnosed on symptomatology such as the presence of a paradoxical nasal obstruction, sequelae of turbinectomy (on the back copy to the imaging), and a cotton test. +/-	Medpor Implant positioned in submu queux on the internal partition sinuso-na dirty or pit floor na dirty.	Follow-up at 3, 6 and 12 months post-operative. Score SNOT-25. BDI score II. BAI score.	**Significant decrease in the total SNOT-25 score at 3, 6 and 12 months postoperatively:** 64.9 ± 24.7 preoperatively *versus* 32.9 ± 20.7 at 3 months postoperatively, 30.2 ± 22, 9 to 6 months postoperative, and 29.1 ± 23.8 at 12 months postoperative ($p < 0.01$). **Significant reduction in the BAI total score at 3, 6 and 12 months postoperatively** 19.8 ± 13.3 : preoperatively *versus* 8.5 ± 9.8 at 3 months postoperatively, 9.6 ± 11.0 at 6 months postoperative, and 8.7 ± 10.0 at 12 months postoperative ($p < 0.01$). **Significant decrease in the total BDI-II score at 3, 6 and 12 months post-operative** 20.7 ± 15.3 preoperatively : *versus* 8.2 ± 11.2 at 3 months post-operative, 8.0 ± 9.8 at 6 months postoperative, and 7.8 ± 10.7 at postoperative months 12 ($p<0.01$). **In univariate analysis, the score SNOT-25 at 6 months post**	The authors esti ment that the anxiety-depressive status of SNV patients is the most important predictor of the results of a chi rehabilitation surgery and may predict the persistence of symptoms after surgery. BDI-II scores > 28.5 and BAI > 20.5 are predictive of the persistence of symptoms after rehabilitation surgery. A Appropriate preoperative psychological care could optimize surgical results.

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					was significantly associated with BDI scores **preoperative II and BAI** (ÿ = 0.64 and 0.87; p = 0.006 and < 0.001, respectively). **In multivariate analysis, only the preoperative BAI score was significantly associated with the SNOT-25 score at 6 months postoperatively** (ÿ = 0.49, p = 0.036). A study of the correlations of Spearman also found a strong correlation between postoperative SNOT-25 scores and BDI-II and BAI scores postoperative (rs = 0.751 and 0.884, p < 0.001). **Study of ROC curves:** preoperative BDI-II score (AUC = 0.695, p = 0.043) and preoperative BAI score (AUC = 0.737, p = 0.014), BDI-II score > 28.5: sensitivity: *61* , 5%, *specificity :* 71.9%, BAI score > 20.5: *sensitivity :* 76.9%, *specificity :* 56.2%.

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Jang, 2011 (38)	Retrospective observational study	4	17 SNV patients who underwent endonasal microplasty between October 2006 and November 2010. Diagnosis of VNS based on characteristic symptoms, history of partial or total turbinectomy, and endoscopy of the structures turbines partially or totally absent. 5 patients not clinically assessed (only radiologically) due to follow-up insufficient or milking methods different.	Cartilage - septal if possible, leaving 1 to 1.5 cm anterior and superior; - concha if septal cartilage cannot be taken (history of septoplasty); - costal auto logue or homolog. Implant positioned in submu queux on the internal partition sinuso-na dirty under the remnant of lower turbinate remaining laughing, preserving the ostium of the way the crymal.	Improvement of the symptoms felt by the father.	Average follow-up of 11.8 months (between 6 and 27 months depending on the patient). 9 out of 12 patients said they were satisfied with the results of the surgery. Improvement in symptoms expressed before surgery (expressed as VAS) - excessive airflow (n = 7): 8.86 ± 1.26 pre-op *versus* 2.71 ± 3.36 (p = 0.027); post-op - nasal obstruction (n = 6): 8.0 ± 2.57 pre-op *versus* 3.0 ± 2.0 (p = 0.028); - nasal or facial pain (n = 6): 8.33 ± 1.37 pre-op *versus* 2.33 ± 3.39 post-op (p = 0.042); - rhinorrhea (n = 3): 7.0 ± 3.61 pre-op *versus* 4.67 ± 3.06 post (p = 0.180); op - headache (n = 2): 8.5 ± 2.12 pre-op *versus* 0 post-op (p = 0.180). An undercorrection was observed ve in 3 patients, two of whom benefited from a second in intervention with addition of carti width of contra-lateral concha.	The authors esti ment that the use of cartilage for dirty endona microplasties made it possible to improve the symptoms of SNV patients with a low com rate plications and better tolerance than a synthetic material. Cartilage harvesting may be responsible for morbidity, particularly because cartilage from a single conch may be insufficient. Of more, the implanted cartilage tends to resorb into the duration. For the authors, the positioning of the implant at the level of the posterior third or the posterior half of the cavity

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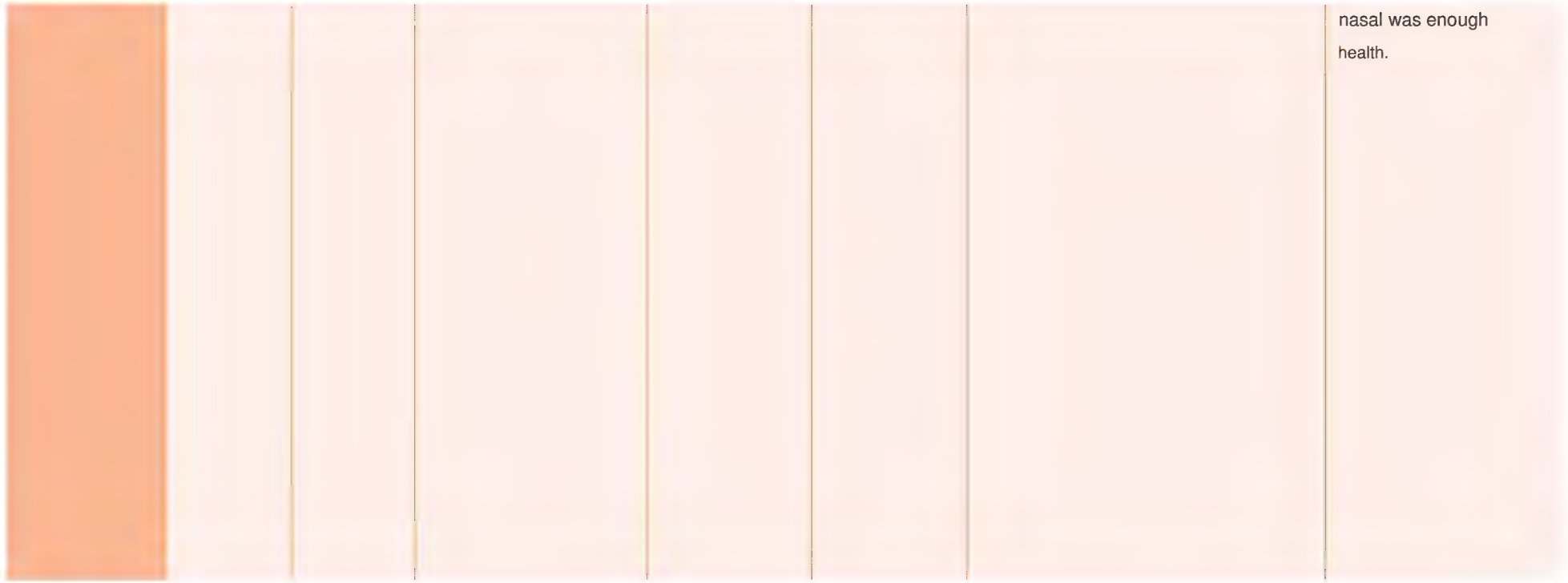

nasal was enough

health.

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Jiang, 2013 (77)	Study prospective objective service nally	4	19 VNS patients. 15 men, 4 women. Average age 32.2 years (18-64 years). Patients presented with symptoms such as sensation of a flow excessive airflow, paradoxical nasal obstruction, nasal or facial pain inspiration, scabs, dried resse, sleep disturbances, depression. All patients had a history turbinecto tooth partial or total crumb. The dirty na endoscopy and CT scan found of the lower turbinates partially or totally man quants. Before implantation, patients	Medpor (Po rex Surgical Inc., New nam, GA). Implant positioned in submu queux on the internal partition sinuso-na dirty under the remainder of the lower turbinate remaining laughter, and for some more seriously affected patients, also on the expensive level of nasal cavity and on the sept tum in front cornet in lower man as to. 1 to 4 parts implanted in each cavity (from 3 to 13 x 20 to 38 x	Follow-up at 3, 6 and 12 months post-operative. Expressed symptomatology. scores SNOT-20 *(Sino-Nasal Outcome Test).* Endoscopy. To scan. Rhinometry acoustic (nasal resistances or NAR, nasal volume or NV, and dry area tion mini mum or MCA). clearance mucosa binder.	No displacement or resorption of the implant. A partial extrusion. No inflammatory reaction or allergic. All patients experienced clinical improvement, feeling less dyspnoea, less dryness and scabs. SNOT-20 scores: 50.1 (± 18.7) preoperative *versus* 22.6 (± 15.8) at 3 months postoperative, 20.4 (± 18.9) at 6 months postoperative , and 37.7 (± 7.6) at one year postoperatively. Difference not statistically significant at one year post-operative (p = 0.736), but significant at 3 months (p = 0.037) and 6 months (p = 0.007) post-operative. Significant differences before and 6 months after surgery on the “dryness” items (p < 0.001) and “difficulty breathing through the nose” (p = 0.01). Significant difference concerning the “nose too open” item at 3 months (p = 0.002) and 6 months (p = 0.006).	The patients all had an increase in resistance nasal passages after surgery. According to the authors, the inferior turbinates are the structures main blades responsible for resistance na dirt which is essential for good lung function. Their re construction increases the contact surface between the inspired air and the nasal mucosa and thus optimizes nasal respiratory function. Shrinkage of the caliber of pits nasal after placement of an implant results in a lower inspired air flow and therefore less crusts and salt dear

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		enjoyed of care allowing a maximum hydration, and will wait a year after the last turbine surgery.	3mm). Suture and me 1 to 2 days. Antibiotic therapy lactic prophylaxis for one week.		No significant difference on the items “suffocation” and « scabs nasals”. No significant difference in mucociliary clearance before and after surgery. NAR increased of from 1.03 cmH2O/L/Mi (± 0.64) preoperatively to 1.91 (± 0.73) A year postoperatively (p = 0.048). No significant difference at 3 and 6 months postoperatively. MCA decreased from 0.67 cm2 (± 0.10) preoperatively to 0.40 (± 0.11) at one year postoperatively (p = 0.006). No significant difference at 3 and 6 months postoperatively. NV decreased from 19.02 cc (± 4.65) preoperatively to 0.51 (± 0.85) at 3 months postoperatively (p = 0.029) and to 11.33 (± 2.62) A year at postoperative (p = 0.035). No significant difference at 6 months post-operative.	mucosa. For the authors, the Medpor is superior to other ma synthetic or cartilage materials, with reduced risk of migration and infection, potential for neovascularization, and availability of suitable prefabricated forms.

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Jiang, 2014 (39)	Retrospective observed tional study	4	24 SNV patients, 18 men, 6 women. Average age 32.4 years (18-64 years). The inclusion criteria if we were : 1) a characteristic symptomatology (sensation of excessive airflow, nasal obstruction paradoxical, nasal or facial pain at inspiration, scabs, depression); 2) a history of partial or total turbinectomy; 3) an absence of turbinal structure at nasal cavity endoscopy and to scan. Patients for whom the history of turbinecto mie went back to less than 2 years old were excluded.	Medpor (Po rex Surgical Inc., New nam, GA). Implant positioned in submu queux on the internal partition sinuso-na dirty under the remainder of the lower turbinate remaining laughter, and for some more seriously affected patients, also on the expensive level of nasal cavity and on the sept tum in front cornet in lower man as to. 1 to 4 parts implanted in each cavity (from 3 to 13 x 20 to 38 x	SNOT-25 *(Sino-Nasal Outcome Test)* at 3, 6 and 12 months post-operative.	5 patients benefited from a left implant, 4 patients benefited from a right implant, and 15 patients benefited from a bilateral implantation. The SNOT-25 total score was significantly lower at 3, 6, and 12 months postoperatively than preoperatively (p = 0.045, <0.001, and <0.001 respectively) with differences between the preoperative score and the scores at 3, 6 and 12 months postoperatively of 18.71 points, 37.62 points and 40.56 points respectively. The 5 items of the SNOT-25 score the most frequently noted as important preoperatively were “asthenia”, “decreased concentration”, “sad mood”, “dryness”, and “the nose is too open”. The specific scores for these 5 items were significantly reduced postoperatively compared to preoperatively. The Cronbach score was 0.9 (p < 0.001), suggesting a	The authors con believe that reconstructive surgery of the lower turbinates significantly improves nasal symptomatology as well as psychological disorders in SNV patients. Rehabilitation surgery has a positive impact on the psychological state of patients. of Use SNOT-25 is a or useful in evaluating tion of the results of rehabilitation surgery of the SNV, since it includes a detailed list of symptoms expressed by SNV patients and can be completed in just two minutes. The co electrical internal herence vee and the good reproducibility of

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				3mm). Suture and me 1 to 2 days. Antibiotic therapy lactic prophylaxis for one week.		good internal consistency of score SNOT-25. 15 patients who completed the SNOT-25 6 months after surgery were contacted by email and completed the test again 2 weeks and 4 weeks later. The correlation coefficient from Pearson has regained a strong correlation between scores at 2 and 4 weeks ($r = 0.9$, $p < 0.01$).	this test allows its clinical application. According to the authors, a limitation of their study is that some participants discontinued their follow-up within the first postoperative year. The loss of these data can be a source of bias if patients withdrew from the study for a reason related to this treatment.

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Jung, 2013 (60)	Retrospective study observed tional	4	31 patients having benefited from a mi dirty endona cropplasty between may 2008 And July 2012. 17 patients with im cartilage plant of conch. 14 patients with costal cartilage implant. Diagnosis of SNV based on history turbinal reduction surgery tooth, a loss of turbinal tissue less than endoscopy of the nasal cavities, and characteristic symptoms (excessive airflow, nasal obstruction, nasal pain or facial on inspiration, headache).	cartilage of conch or costal. A concha cartilage was used for THE substance loss small volume, a side car tilage for loss of substance of high volume, based on evaluation pre-operative chi urgerian. In course of study, the use of cos tal cartilage increased in front observation better results in using this material.	SNOT-25 *(Sino-Nasal Outcome Test)* between 6 and 11 months post-operative. Collections at 6 and 12 months post-operative.	Significant decrease in SNOT-25 score in both groups ($p < 0.05$). In the “conchal cartilage” group: from 54 (EI 25-75% = 45.0-67.5) preoperatively to 35.9 (EI 25-75% = 24.0-51.5) in postoperative ($p = 0.007$). In the “cost cartilage” group: from 43.8 (EI 25-75% = 27.0-57.8) preoperatively to 21.9 (EI 25-75% = 9.0-40.8) postoperatively ($p = 0.002$). Significantly greater improvement in the “costal cartilage” group than in the “concha cartilage” group ($p = 0.023$). In the “conchal cartilage” group, significant improvement in the items *reduced productivity, reduced concentration, and frustration/ irritability* ($p<0.05$). In the “cost cartilage” group, significant improvement in the 3 items improved in the group “conch cartilage” and also items *runny nose, postnasal discharge,*	Costal cartilage is more effective than conchal cartilage in the surgical rehabilitation of VS. Better improve tion of the SNOT score 25 and also functional items rhinological.

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				Implant positioned in sub mucosa periosteum next to the inter septum sinuso-na dirty.		*waking up at night, dryness, difficulty with nasal breathing, nose being too open, and nasal crus ting* ($p < 0.05$). Absence of complications (infection, extrusion, allergic reaction).	
Kim, 2018 (61)	Study prospective objective service nally	4	9 VNS patients. Diagnosis of ENV on a history volume reduction surgery turbinal, a positive cotton test, sequelae of turbinectomy on the back copy of the nasal cavities and scan ner, and the presence of suggestive symptomatology.	Fraction go eye stereo male autologous (SVF). SVF obtained by sampling abdominal fat, reaction enzymatic by collagen nose,	Score SNOT-25 at 2 weeks, 1 month, 2 months, 3 months and 6 months post-operative. Satisfaction of the patient. Post-operative complications.	Average SNOT-25 score at 6 months postoperatively (64.2 ± 35.8) not significantly different from the average preoperative score (70.1 ± 24.7, $p > 0.05$). Satisfaction questionnaire: two patients (i.e. 22% of patients) feeling an improvement, 78% not feeling any improvement. For the two patients feeling improved, mean SNOT-25 score at 6 months equal to 19.5	Explanations proposed by the authors for the lack of effectiveness observed: a single injection may not be enough. Due to the morbidity of fat removal, the use of cel the strains could be a interested alternative health.

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			Patients who had a history turbinecto tooth crumb total radical were excluded because considered to be best candidates to a reconstruction by costal cartilage.	centrifugation, filtration and dilution. Injection of SVF at the medial part of the two horns net lower laughing.	Secretions nasal stu 2 months before and 6 months after injection, compared sound with a control group of 5 healthy subjects.	against an average score of 55 preoperatively. Study of nasal secretions: levels of interleukins (IL)-1ÿ, IL-8, and *calcitonin gene-related peptide* significantly higher in SNV patients ($p < 0.001$). At 6 months after injection, the concentrations of IL-1ÿ and IL-8 were significantly reduced ($p < 0.005$). Complications: a seroma.	Despite the lack of improvement, a decrease in the level mu inflammation queuse was observed after the injection.
THE **Good, 2020 (40)**	Study prospective objective service nally	4	14 SNV patients, 7 of whom followed the procedure to the end (2 lost sight of, 5 dropouts in the first 12 days). Diagnosis of NSV on a history bi turbinectomy side, symptoms of SNV, and an ENS6Q score ÿ 11.	Stimulation nasal trigeminal (stimulation of TRPM8 receptors). inhalation of solution of levomenthol and diluted eucalyp tol, for 10 seconds, 3 times a day,	Score NOSE. Score SNOT-22. Score ENS6Q.	Significant reduction in NOSE score from 12.4 to 9.8/20 ($p = 0.027$). No change in score ENS6Q. Significant reduction in SNOT-22 score from 63.7 to 50.7/110 ($p=0.028$). Absence of significant difference between the questionnaires of patients who completed the procedure and those who abandoned it before the end.	Nasal trigeminal stimulation could reduce the impact of symptoms altering the quality of life of patients SNV, especially obstruction nasal passage, sleep disorders and sta tut emotional. The absence of modi scoring ENS6Q suggests that the severity of

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				for 30 days.			symptoms of VNS do not depend solely on the obstruction nasal tion.
Lee, 2016 (75)	Study prospective objective service nally	4	20 SNV patients with a positive cotton test.	implant of Medpor *(po high red density po lyethylene)* or auto bone grafts logs (taken from the bone septum). Positioned in submu ceux at the floor of the pits na dirty.	BDI score II. BAI score.	Score BDI-II Before surgery: 45% severe depression, 20% moderate depression, 20% mild depression, 30% scores normal. After surgery: significant improvement in mean score from 24.4 (moderate depression) to 6.3 (normal), $p < 0.001$. The preoperative BDI-II score was significantly correlated with the improvement in the postoperative BDI-II score ($p < 0.001$). In multivariate analysis, preoperative BDI-II score and gender were predictive factors of postoperative improvement ($p < 0.001$ and $p = 0.006$ respectively).	The psychological symptoms of VS could be improved by a single surgical treatment without cognitive therapy or associated antidepressant or anxiolytic treatment. SNV patients with the worst BDI-II scores and Pre-operative BAI would be the most improved after surgical treatment.

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					Score BAI Before surgery: 40% severe anxiety, 15% moderate anxiety, 15% mild anxiety, 35% scores normal. After surgery: significant improvement in mean score from 19 (moderate anxiety) to 6.8 (normal), $p < 0.001$. In multivariate analysis, the preoperative BAI score was the only significant predictor of postoperative improvement. ($p<0.001$).	

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Lee, 2018 (41)	Study prospective objective service nally	4	30 SNV patients included between 2010 and 2015 with an ante ceding of turbinec inferior toma and a positive cotton test.	Implant of Medpor *(po high density red po lyethylene).* Positioned in submu queux - : at the floor of the nasal cavity for 14 patients; - in the wall its inter if nuso-nasal for 16 pa likes.	Score SNOT-22. BDI score II. BAI score. In pre-operative and at 1 year post-operative.	Score SNOT-22 : - significant decrease in the total score in both groups (p=0.002 And p<0.001). Mean score of 21.1 in the implant group in the inter-sinus-na septum dirty versus 11.8 in the nasal cavity floor implant group, but non-significant difference (p = 0.096); - also significant reduction concerning the sub-categories of the score in the two groups (p < 0.05 and < 0.001). The implant group in the inter-sinus-nasal cloi had a more noticeable improvement than the implant group at the expensive plan of the nasal fossa concer nant THE rhinological symptoms and sleep (p = 0.04 and 0.002). Score BDI-II : significant decrease in both groups (p = 0.031 and p < 0.001). Score BAI : significant decrease in both groups (p = 0.004 and p < 0.001).	Improvement of symptoms of VS after implantation in the inter septum nasal sinus and floor of the nasal cavity. Bigger score improvement SNOT-22 after im planting in the intersinus septum nasal, in particular on rhinological symptoms and disorders of the sleep.

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					No significant difference in improvement between THE two groups. In multivariate analysis, the implantation site was the only significant factor in the improvement of the SNOT-22 score after surgery (p = 0.011). Absence of reported complications

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Leong, 2015 (86)	Review systematics of literature ture	4	Systematic review of studies on surgical rehabilitation of the SNV. 128 SNV patients collected from 8 studies. All patients had a history turbinecto tooth crumb. According to studies, the degree of resection (partial or total) was not consistently de crit.	Rehabilitation surgeries of the SNV: - location submu queuse in several sites: expensive plan of the nasal fossa, internal septum sinuso-na dirty, remnant of the cornet in inferior; - several materials: AlloDerm (acellular dermis), Med por *(porous high-density* *polyethylene),* autologous (septum, conch) or homologous cartilage, hya luronic acid, ÿ tricalcium	scores SNOT (5 studies). NOSE, Rhi noQol (1 study). 10-point scale (1 study). Rhinometry acoustics (1 study). Duration tracking com taken between 6 and 48 months.	Reduction of SNOT-20 scores from 48.3 to 24.4 ($p < 0.05$), and SNOT-25 from 65.9 to 33.3 ($p < 0.05$) (103 patients in 5 studies). Reduction in NOSE scores and RhinoQol (a study of 5 patients). Improvement on 10-point scale in 9 out of 17 patients in study. a Initially improved acoustic rhinomanometry but at 12 months, the effects of surgery were maintained in only one patient in a study involving subjects. on 3 Implant extrusion in 6 cases.	Little or no improvement after surgery for 20% of patients. Importance of one of long-term follow-up (>12 months) based on subcriteria jectives (SNOT-25) and objectives (rhinoma nometry).

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				phosphate; - eta volume arbitrary bli is lying in function of the of substance loss observed.			
Tue, 2017 (83)	Review systematics of literature ture	3	Systematic review of prospective studies on rehabilitation surgical treatment of the SNV. 6 studies involving a total of 122 patients: - 4 prospective studies; - 2 randomized trials his.	Installation of equipment of synthesis or auto graft Genoa.	Score SNOT.	Significant reduction in the SNOT score of 23.16 points on average postoperatively (95% CI 21.06-31.21, p < 0.00001). Significant difference between autologous and non-autologous implant groups in terms of improvement in SNOT score, with better efficacy of implants No autologous (p < 0.05).	*Note: the study of Jung from 2013 is labeled randomized controlled trial but it is in fact a real study observational retrospective.*

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Modrzynsky, 2011 (81)	Study prospective objective service nally	4	3 SNV patients.	Injection of hya luronic acid into the corns net lower laughing and lower front part of the partition does dirty.	Subjective assessment. Rhinoscopy Rhinometry acoustic. one-to-one follow-up week, 3, 6 and 12 months post-operative.	On D7: improvement felt by the three patients regarding the sensation of air passing through the nose, reduction in dryness, crusts and secretions. Acoustic rhinometry at 7 days, 3 and 6 months confirming that the effects of surgery were maintained, without complications. At 12 months: persistence of the effects of surgery on only one of the three patients. Absence of inflammation, allergic reaction, extrusion or displacement of material.	Limited study of the fact of the low number of topics. Minimally invasive, simple and safe surgery.
Saafan, 2013 (43)	Study forward-looking ran domesticated	3	24 SNV patients included between May 2008 and June 2010, reporting an improvement tion after test at cotton.	ran patients dominated in two groups: - silastic implant; - acellu dermis implant lar (Al loDerm). Implants	SNOT-25. Nasal endoscopy. Follow-up at 1, 3, 6, 12 and 18 months postoperatively.	Reduction in mean SNOT-25 score from 61.4 before implantation to 33.6 after implantation in the silastic group, and from 63.7 before implantation to 34.2 after implantation in the AlloDerm. band No significant difference between the two groups. 4 silastic extrusions. 3	Slow equivalent effectiveness of silastic and the AlloDerm. Noted improvement in both patient groups. Procedure without dangerous and simple.

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				submu cues on the septum, the floor of the pits na dirty and the internal partition sinuso-na dirty.		minor exposures of Al loDerm in the first two post-operative weeks, having healed without complication.	
Tam, 2014 (58)	Study re retrospective observed tional	4	18 SNV patients included between 2006 and 2011 including 2 excluded (lost to sight). SNV diagnosed on a history of turbinate surgery, symptoms of obstruction paradoxical nasal, wind disorder nasal tilation and pharyngeal dryness, and a positive cotton swab test.	Submucosal implant of Medpor at pit floor na dirty +/- on the septum.	SNOT-22. 3-way follow-up months and 12 postoperative months.	Reduction in SNOT-22 score average: - 39.25 ± 21.44 preoperatively; - 19.81 ± 16.17 ($p < 0.05$) at 3 months postoperatively; - 16.19 ± 13.98 ($p < 0.05$) at 1 year postoperatively. Two complications - : one patient developed chronic hypertrophic rhi nitis four years after implantation requiring long-term nasal corticosteroid therapy - one patient with implant extrusion 6 months course ; after surgery, requiring partial sectioning and removal under local anesthesia.	Interest of the co test tone to validate the surgical indication. Long-term follow-up is needed sary in front of the dev possible development of chronic hypertrophic rhinitis and possible extrusion of the implant.

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Thamboo, 2020 (59)	Study prospective objective service nally	4	10 SNV patients included between September 2014 and May 2017. Diagnosis of SNV on discomfort na sal and/or an obs construction nasal paradoxical despite a vacuity of the nasal cavities related to a turbinal reduction, an ENS6Q score ÿ 11, and a cotton test positive.	IMAP (procedure for increasing the inferior meatus laughing): - graft of SIS *(Small) Intestinal Submucosa)*, ex matrix tracellular isolated from porcine intestine OR - acel dermis lular (Al loDerm).	ENS6Q. PHQ-9 *(Pa holds Health Questionnaire-9).* GAD-7 *(Generalized Anxiety Di sorder 7-item Scale).* SNOT-22 *(22-item Sino-Nasal Outcome Test).* Collections at a to maine, 1, 3 and 6 months post-operative.	Reduction in mean ENS6Q score from 21.55 preoperatively to 14.14 ($p > 0.05$) at one week, 10.89 ($p < 0.01$) at 1 month, 9.88 at 3 months ($p < 0.001$) and 8.25 at 6 months ($p < 0.001$). Reduction in PHQ-9 score by 14.91 preoperatively to 9.14 ($p > 0.05$) at one week, 7.56 ($p < 0.05$) at 1 month, 4.88 at 3 months ($p < 0.001$) and 6, 63 at 6 months ($p < 0.01$). Reduction in GAD-7 score by 14.64 preoperatively at 8 ($p > 0.05$) at one week, 8.56 ($p > 0.05$) at 1 month, 4.75 at 3 months ($p < 0.01$) and 5, 13 to 6 months ($p < 0.01$). Reduction of SNOT-22 score by 162.82 preoperatively to 54.43 ($p > 0.05$) at one week, 43.88 ($p > 0.05$) at 1 month, 32.5 at 3 months ($p < 0.001$) and 31, 63 at 6 months ($p < 0.001$).	Improvement of quality of life and psychological well-being of patients SNV after implantation of biomate rials. Need for follow-up in the longer term (resorption of the fon graft over time?).

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Velasquez, 2015 (62)	Study prospective objective service nally	4	3 SNV patients included between January and December 2014. Diagnosis based on symptoms of SNV and a history of lower turbinate reduction surgery laugh.	SIS *(Small) Intestinal Submucosa),* ex matrix tracellular isolated from in testin of pork. Location submu tail next to the inferior turbinate laughing man as to.	SNOT-25. Follow-up at 1, 4 and 12 se hands post-operative.	Reduction in SNOT-25 score average of 77.6 preoperatively at 65 at 1 month, 57 at 4 weeks, and 55 at 12 weeks ($p < 0.01$). Specifically, improvement in the items " *difficulty with nasal breathing* " and " *nose is too open* ", at 4 and 12 weeks postoperatively. No complications.	Limited study of the fact of the low number of subjects and the lack of long-term follow-up term. Preliminary study in which the use of SIS appears to be safe and effective that's.
Xu, 2015 (82)	Study prospective objective service nally	4	30 SNV patients included between August 2014 and January 2015.	cells adi strains can. Sampling abdominal fat, reaction in zymatic by nase collagen, centrifugation, filtration. Injection at the	Subjective assessment. clearance mucociliary. Rhinometry acoustic. Collections at 3, 6 and 9 months. Histological analysis of nasal mucosa in pre	Improvement of symptoms in 28 patients (better hydration of the nasal mucosa, reduction in pain and nasal obstruction on inspiration, improvement in the quality of sleep). In two patients, less improvement, only reduction in the dryness of the birth pits dirty. On endoscopy at 3 months, decrease in secretions and scabs.	Injection of adi stem cells induce could the cells epithelial cells to improve the function of the nasal mucosa in the SNV.

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				medial part of two cones lower.	operative and at 1 month.	Ame saccharin clearance improved at 3 months and 6 months: 1,526.23 ± 1,000.43 s preoperatively *versus* 1,457.13 ± 1,078.23 s at 3 months, 1,232.03 ± 499.45 s at 6 months ($p < 0.05$), and 1,501, 00 ± 1159.85 s at 9 months. Significant increase in nasal resistance at 3, 6 months. And 9 Decreased ob inflammation served in the dirty nasal mucosa, alignment of collagen fibers, increase in proteins produced by goblet cells, presence of epithelial markers (cytoké ratines 7, 14 and 19).	
Malik, 2021 (78)	Study prospective objective service nally	4	5 SNV patients with a score ENS6Q ÿ 11, improved by a cotton test and/or an injection of filler in areas of turbinal tissue loss with a waterfall	IMAP (procedure for increasing the inferior meatus laughing) by im plantation submu questing of costal cartilage implants opposite	Creation of models in simulation digital flows lies *(Computational Fluid Dynamics-CFDs)* based on on	Reduction in ENS6Q score by 14 ± 4.06 (95% CI: 10.44-17.56) preoperatively to 4.8 ± 2.77 (95% CI: 2.37-7.23) postoperatively. In CFDs: significant alteration of nasal ventilation pattern after implantation decrease in : * the percentage	rehabilitation chi rurgical allows you to modify the ventilation parameters nasal passage in decreasing the airflow in the middle corridors and increasing the airflow in the corridors

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			minus 7 points of the ENS6Q score.	of the partition cross-sine nasal.	preoperative scan and a scanner more than 6 months postoperatively. Score ENS6Q.	of air passing through the middle meatus, going from 67.13% ± 11.14 (95% CI: 60.22%-74.04%) to 46.18% ± 12.81 (95% CI: 38.23 -54.12), increase in the percentage of * air passing through the inferior meatus, from 30.55% ± 11.29 (95% CI: 23.55-37.55) to 42.59% ± 9.6 (95% CI: 36.63-48.54); - absence of signifi cant differences on the resistances na pre and post-operative dirty rooms; - the improvement in the ENS6Q score was significantly correlated with the reduction in the percentage of air passing through the middle meatus postoperatively.	lower, correlated with improvement ration of patient symptoms.
Ushio, 2022 (80)	Study prospective objective service nally	4	6 SNV patients with improvement ration with the test to cotton.	Location submu auricular cartilage layer placed at the level of the pit floor na dirty.	Nasal endoscopy. CT scan tometry. Score ENS6Q. Score SNOT-20. Score SNOT-25. Rhinomano metrics.	Reduction in SNOT-20 score: 48.8 preoperatively *versus* 30.2 postoperatively (p = 0.03). Reduction in SNOT-25 score: 63.3 preoperative *versus* 38.4 (p = 0.03). Reduction in post-operative ENS6Q score: 18 preoperative *versus* 9.7 postoperative (p = 0.04). Significant increase in nasal resistance: 0.13 ± 0.02	Improvement of symptomatology and increased nasal resistance after surgical rehabilitation of the SNV.

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						Pa/cm³/s preoperatively *versus* 0.16 ± 0.02 Pa/cm³/s postoperatively (p = 0.02).	
Dholakia, 2021 (79)	Study prospective objective service nally	4	17 SNV patients who underwent endonasal microplasty between July 2017 and February 2020. Diagnosis of SNV established on a characteristic A symptomatology, history of turbi partial or total nectomy, a score ENS6Q ÿ 11, and improvement after cotton test with a drop of at minus 7 points of the ENS6Q score.	IMAP (procedure for increasing the inferior meatus laughing) by im plantation submu application of costal cartilage implants next to the septum cross-sine nasal.	Score ENS6Q. Score SNOT-22. GAD score 7. HQP score 9. Collections preoperatively then at 1, 3, 6 and 12 months postoperatively.	Significant decrease in the total ENS6Q score at 1, 3, 6 and 12 months postoperative: 18.7 : preoperatively *versus* 7.4 at 1 month postoperatively (p < 0.0001), 8.0 at 3 months postoperative (p < 0.0001), 7.8 at 6 months postoperative (p < 0.0001), and 8.4 at 12 months postoperative (p = 0.0003). 5 of the 6 items of the ENS6Q were significantly improved at 12 months postoperatively: " *suffocation* ", " *dryness* ", " *sense of diminished airflow* ", " *nasal crusting* " and " *nasal burning* ". The " *nose feels too open* " item was not significantly improved at 6 months or 12 months. Significant decrease in the total SNOT-22 score at 1, 3, 6 and 12 months postoperatively: 46.8 preoperatively *versus*	Improvement of VS symptoms up to one year after surgical rehabilitation gical. Rib cartilaginous grafts taken from cadavers, to avoid morbidity linked to autologous sample.

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					30.6 at 1 month post-operative (p = 0.0021), 32.4 at 3 months post-operative (p = 0.0227), 30.9 at 6 months post-operative (p = 0.0004), and 29.4 at 12 months postoperatively (p = 0.0024). Significant improvement in items relating to sleep quality at 12 months postoperatively. Decreased GAD-7 scores and PHQ-9 postoperatively not statistically significant.	

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Annex 1. Documentary research 155

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Annex 1. Documentary research

ÿ Method

The search focused on the topics and types of studies defined in agreement with the project leaders and was limited to publications in English and French.

The research covered the period January 2000-November 2020 and a watch was carried out until May 2022. The following sources were questioned:

ÿ the Embase and Medline databases;

ÿ the *Cochrane Library ;*

ÿ websites publishing recommendations, technological, ethical or economic assessment reports;

ÿ the websites of learned societies competent in the field studied.

This research was supplemented by the bibliography of the experts and the references cited in the documents analysed.

Bibliographic databases

The search strategy in the bibliographic databases is built using, for each subject, either terms from thesaurus (descriptors) or free terms (from the title or abstract). They are combined with the terms describing the types of studies.

The following table presents the search strategy in the Medline and Embase databases.
In this table, duplicate references may be present between the different themes and/or types of studies.

Type of Study/Subject		Search period	Number of references found
	Terms used		
EMPTY NOSE SYNDROME			
Step 1	(empty nose) OR empty nose)/ti,ab	Jan.00 Nov. 20	99
TURBINECTOMY – ENDONASAL SURGERY			
RECOMMENDATIONS, CONSENSUS CONFERENCES		Jan.00 Nov. 20	20
2nd step	((Turbinates/surgery OR turbinate/surgery)/de OR (Turbinectom* OR Turbinate* PRE/0 reduction OR turbinate* PRE/0 resection OR turbinate* PRE/2 Surger* OR turbinoplast*)/ti,ab) OR ((Nasal Surgical Procedures OR nose surgery endoscopic endonasal surgery)/de OR (Endonasal PRE/0 surgery)/ti,ab) AND ((turbinate OR Turbinates)/de OR turbi nate*/ti,ab))		
AND			
Step 3	(consensus OR guideline[*1] OR position PRE/0 paper OR recommendation[*1] OR statement[*1])/ti OR (health planning guidelines OR		

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	consensus development OR Practice Guideline)/de OR (consensus de development conference OR consensus development conference, NIH OR guideline OR practice guideline)/type		
META-ANALYSES, SYSTEMATIC REVIEWS		Jan.00 Nov. 20	23
2nd step			
AND			
Step 4	(meta PRE/0 analys[*3] OR metaanalys[*3] OR systematic PRE/0 literature ture PRE/0 search OR systematic* PRE/0 literature PRE/0 review[*3] OR systematic* PRE/0 overview[*3] OR systematic* PRE/0 review[*3])/ti OR (meta-analysis OR systematic review)/de OR (meta-analysis OR system atic review)/type OR (cochrane database system rev)/so		
TURBINECTOMY – ENDONASAL SURGERY: SIDE EFFECTS			
CONTROLLED TRIALS (RANDOMIZED – NON-RANDOMIZED)		Jan.00 Nov. 20	145
2nd step			
AND			
Step 5	(nose obstruction OR atrophic rhinitis OR rhinitis OR dyspnea OR hyperventilation OR sino-nasal outcome test OR rhinomanometry OR Nasal Obstruction OR Rhinitis OR Rhinitis, Atrophic OR Dyspnea OR Hyperventilation OR Sino-Nasal Outcome Test OR Rhinomanometry OR adverse event OR nose surgery/side effect OR nose surgery/complication OR nose reconstruction/ complication OR nose reconstruction/side effect OR Nasal Surgical Procedures/adverse effects)/de OR (nasall PRE/0 obstruction OR athrophic PRE/0 rhinitis OR nasal PRE/0 crusting OR nasal PRE/0 obstruction OR nasal PRE/0 dryness OR nasal PRE/0 pain OR cotton PRE/ 0 test OR SNOT OR ENS6Q OR dyspnea OR hyperventilation OR rhinomanometry)/ti,ab OR (complication*)/ti)		
AND			
Step 6	((random*)/ti,ab OR (cross-over studies OR double-blind method OR ran dom allocation OR single-blind method OR controlled clinical trial OR crossover procedure OR double blind procedure OR multicenter study OR randomization OR randomized controlled trial OR single blind procedure)/de OR (Controlled Clinical Trial OR multicenter study OR random ized controlled trial)/type)		
COMPARATIVE STUDIES – UNCONTROLLED CLINICAL TRIALS		Jan.00 Nov. 20	87
Step 2 AND Step 5			
AND			
Step 7	(clinical PRE/0 trial* OR comparative PRE/0 stud* OR versus)/ti OR (Clin ical Trial OR Clinical Trial OR comparative study)/de OR (comparative study)/type		
TURBINECTOMY – ENDONASAL SURGERY: SIMULATION FLOW NUMERICAL			

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CONTROLLED TRIALS (RANDOMIZED – NON-RANDOMIZED)		Jan.00 Nov. 20	8
Step 2 AND Step 6			
AND			
Step 8	(computational fluid dynamics OR nose airflow OR heat transfer OR Hy drodynamics OR Computer Simulation)/de OR (nasal PRE/0 airflow* OR heat PRE/ 0 transfer OR mucosal PRE/0 cooling OR computational PRE/0 fluid PRE/0 dynamics) /ti,ab		
COMPARATIVE STUDIES – UNCONTROLLED CLINICAL TRIALS		Jan.00 Nov. 20	17
Step 2 AND Step 7 AND Step 8			
TURBINECTOMY – ENDONASAL SURGERY: REHABILITATION SURGICAL			
CONTROLLED TRIALS (RANDOMIZED – NON-RANDOMIZED)		Jan.00 Nov. 20	0
Step 2 AND Step 6			
AND			
Step 9	(transplantation OR Cartilage/transplantation OR Prostheses and Im plants OR Transplantation, Autologous)/de OR (endonasal PRE/0 micro plasty OR submucosal PRE/0 implant)/ti,ab		
COMPARATIVE STUDIES – UNCONTROLLED CLINICAL TRIALS		Jan.00 Nov. 20	3
Step 2 AND Step 6 AND Step 9			
TURBINECTOMY – ENDONASAL SURGERY: ASPECTS PSYCHIATRICS		Jan.00 Nov. 20	
2nd step			
AND			
Step 10	(Mental Disorders OR Psychological Tests OR Serotonin and Noradrena line Reuptake Inhibitors OR mental disease OR psychological test OR ser otonin noradrenalin reuptake inhibitor)/de OR (anxiet* OR depression* OR depressive* OR stress* OR somat* OR cognitive* OR psychiat* OR psy cholog* OR psychosomatic OR Psychologic burden OR Psychological burden OR nervous breakdown)/ti	Jan.00 Nov. 20	93

from: descriptor; ti: title; ab: summary; * : truncation; type: post type; so: log name

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Websites consulted

As part of this recommendation, the following sites were consulted :

- National Academy of Medicine
- Interuniversity health library
- Lemanissier medical library
- Catalog and index of French-speaking medical sites (CISMeF)
- High Authority for Health (HAS)
- French ENT company – ENT France (SFORL)
- French Society of Otorhinolaryngology and Surgery of the Face and Neck

- *Agency for Healthcare Research and Quality* (AHRQ)
- *American Academy of Allergy, Asthma and Immunology*
- *American Academy of Facial Plastic and Reconstructive Surgery*
- *American Academy of Otolaryngology – Head and Neck Surgery*
- *American Board of Otolaryngology*
- *American Rhinologic Society*
- *Association for Research in Otolaryngology*
- *Australian Clinical Practice Guidelines*
- *Canadian Agency for Drugs and Technologies in Health* (CADTH)
- Federal Center for Health Care Expertise (KCE)
- *Center for Reviews and Dissemination* (CRD databases)
- College of Physicians of Quebec (CMQ)
- *College of Physicians & Surgeons of Alberta* (CPSA)
- *CPG Infobase – Clinical Practice Guidelines*
- *Empty Nose Syndrome International Association* (ENSIA)
- International Federation of ENT Societies (IFOS)
- *Guidelines – Summarizing clinical guidelines for primary care*
- *Guidelines International Network*
- *National Guideline Clearinghouse*
- *National Health and Medical Research Council* (NHMRC)
- *National Institute for Health and Care Excellence – Evidence search*
- *National Institute for Health and Clinical Excellence* (NICE)
- *Scottish Intercollegiate Guidelines Network* (SIGN)
- Canadian Society of Otolaryngology and Head and Neck Surgery
- *Swedish Agency for Health Technology Assessment and Assessment of Social Services* (SBU)
- *Tripdatabase – Turning Research into Practice*
- *US Preventive Services Task Force* (USPTF)

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ÿ Article selection criteria

To be selected, the studies had to meet the following criteria: ÿ population: patients suffering from empty nose syndrome, patients who had undergone surgery for turbinoplasties and/or lower and/or middle turbinectomies;

ÿ types of studies selected: point of view, narrative review, observational studies, comparative trials, meta-analyses of randomized comparative trials, systematic reviews of the literature, studies evaluating a diagnostic test;

ÿ dates of publications: from 2000, keeping only the most recent publications when there are several from the same source and on the same subject;

ÿ limited publications in English and French.

Search results :

in total, 596 bibliographical references were identified from the systematic search carried out. Among these references, 116 were analyzed in their entirety and 86 were retained.

The selection of publications on title and abstract and the extraction of data were carried out by a person.

ÿ Results

Number of references identified: 596

Number of references analysed: 116

Number of references selected: 86

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Attendees

The following professional organizations and patient and user associations have been asked to propose experts invited on an individual basis to the working/reading groups:

Association empty nose syndrome France*

College of General Medicine

French College of Speech Therapy*

National college for the quality of care in psychiatry

National Professional Board of Internists

National Professional Board of Neurology

National Professional Board of Otorhinolaryngology and Cervicofacial Surgery*

National Professional Council of Pneumology*

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French Federation of Psychiatry*

French Federation of Associations and Friends of the Sick, Insufficient or Respiratory Handicapped*

French Federation of Psychologists and Psychology*

French Language Clinical Neurophysiology Society

Physiological Society

French society for the study and treatment of pain

French Society for Sleep Medicine and Research

(*) This organization proposed one or more experts for this project.

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Thanks

HAS would like to thank all the participants mentioned above.

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Abbreviations and acronyms

BDI	Beck Depression Inventory (BDI, BDI-II, BAI, BDI-UU)
CFDs	Numerical simulation of flows (Computational Fluid Dynamics)
CHR	Chronic hypertrophic rhinitis
ENS	Empty Nose Syndrome
ENS6Q	Empty Nose Syndrome 6-item Questionnaire
EQ-5D-5L	EuroQoL-5D questionnaire 5-level version
SSE	Epworth Sleepiness Scale
GAD-7	Generalized Anxiety Disorder Assessment
HAS	High Authority of Health
HVS	Hyperventilation syndrome
CI	confidence interval
MRI	Magnetic resonance imaging
NO	Nitric oxide
nNO	Nasal nitric oxide
ENT	Otolaryngology/otolaryngologist
HQP	Patient Health Questionnaire
ppb	Part per billion (part per trillion)
ADSS score	Adelaide Disease Severity Score
SFORL	French society of otolaryngology and surgery of the face and neck
SIS	Extra-cellular matrix isolated from pig intestine (Small Intestine Submucosa)
SNOT	Sino-Nasal Outcome Test
SNV	Empty nose syndrome
SVF	Autologous stromal vascular fraction
TRPM8	TRPM8 channels (thermoreceptor-like transient receptor potential channel melastatin 8)
WPAI	Work Productivity and Activity Impairment Questionnaire

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RECOMMEND
GOOD PRACTICES

RECOMMENDATION

Prevention, diagnosis and management of empty nose syndrome

Validated by the College on November 17, 2022

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Recommendations for good practice (GPR) are defined in the field of health as proposals developed methodically to help the practitioner and the patient to seek the most appropriate care in given clinical circumstances.

RBPs are rigorous summaries of the state of the art and scientific data at a given time, described in the scientific argument. They do not exempt the healthcare professional from exercising discernment in his treatment of the patient, which must be that which he considers most appropriate, according to his own findings and the patient's preferences.

This good practice recommendation was drawn up according to the method summarized in the scientific arguments and described in the HAS methodological guide available on its website: Development of good practice recommendations – Method Recommendations for clinical practice.

The objectives of this recommendation, the population and the professionals concerned by its implementation are briefly presented on the last page (descriptive sheet) and detailed in the scientific argument.

The latter as well as the summary of the recommendation can be downloaded from www.has-sante.fr.

Grade of Recommendations

AT	**Established scientific evidence** Based on studies with a high level of evidence (level of evidence 1): high-powered randomized controlled trials without major bias or meta-analysis of randomized controlled trials, decision analysis based on well-conducted studies.
B	**Scientific presumption** Based on scientific presumption provided by studies with an intermediate level of evidence (level of evidence 2), such as low-powered randomized controlled trials, well-conducted non-randomized comparative studies, cohort studies.
VS	**Low level of evidence** Based on studies with a lower level of evidence, such as case-control studies (level of evidence 3), retrospective studies, case series, comparative studies with significant biases (level of evidence 4).
EA	**Expert agreement** In the absence of studies, the recommendations are based on an agreement between the experts of the working group, after consultation with the reading group. The absence of gradation does not mean that the recommendations are not relevant and useful. It should, on the other hand, encourage the undertaking of additional studies.

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Description of the publication

Title	**Prevention, diagnosis and management of empty nose syndrome**
Method of working	Recommendation for clinical practice.
Goals)	Prevent empty nose syndrome (VSS). Diagnose and manage patients who develop VS.
Targets concerned	Patients for whom turbinate surgery is proposed. Patients who have undergone such surgery and have developed VNS. Professionals performing such surgical interventions and more broadly all those involved in the prevention, diagnosis, monitoring and management of patients with NSV.
Applicant	Empty Nose Syndrome Association France and French Federation of Associations and Friends of the Sick, Insufficient or Respiratory Handicapped.
Promoter(s)	High Authority for Health (HAS).
Project management	Coordination: Cédric Paindavoine, project manager, HAS good practices department (head of department: Doctor Pierre Gabach). Secretariat: Ms. Jessica Layouni.
Literature search	From January 2000 to May 2022 (cf. documentary research strategy described in appendix 1 of the scientific argument). Produced by Mrs. Marie Georget, with the help of Mrs. Yasmine Lombry and Mrs. Juliette Chazareng (head of the documentation department – monitoring: Mrs. Frédérique Pagès).
Authors	Dr Julie Fernandez Rodriguez, otolaryngologist and cervico-facial surgeon, Marseille – project manager.
Conflicts of interest	The members of the working group communicated their public declarations of interest to HAS. They can be consulted on the website https://dpi.sante.gouv.fr. They were analyzed according to the analysis grid of the HAS guide to declarations of interest and management of conflicts of interest. The interests declared by the members of the working group were considered to be compatible with their participation in this work.
Validation	November 17, 2022 version
Actualization	Updating the recommendation will be considered based on data published in the scientific literature or significant changes in practice that have occurred since its publication.
Other formats	Scientific argument, decision tree and information sheet for patients downloadable from www.has-sante.fr

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Key messages

The following recommendations were considered to be those to be implemented as a priority to improve the quality of care delivered to patients at the time of publication of the good practice guideline.

ÿ Preventive actions are essential in order to minimize the risk of occurrence of an SNV.

ÿ The occurrence of a VNS is always the consequence of a lower or middle turbinal gesture. It is reasonable to link the SNV above all to the movements on the inferior turbinates and to the importance of the turbinal reduction (grade C).

ÿ SNV should be differentiated from atrophic rhinitis which may present the same nasal symptoms but which occurs outside of any context of turbinate reduction or endonasal surgery (AE).

ÿ When they are intended to correct a functional obstructive disorder, it is recommended to proscribe wide inferior turbinectomies which are the most at risk of occurrence of VNS.
In this indication, it is recommended to preserve at least 2/3 of the turbinate structure (AE).

ÿ In the face of chronic nasal obstruction, it is recommended to look for an inflammatory, tumoral, pseudo-tumoral or infectious cause that would require specific management, then to look for the architectural, mucosal or mixed origin of the nasal obstruction chronic (AE).

ÿ If performing a septoplasty or rhino-septoplasty intended to correct a chronic nasal obstruction of purely architectural origin, it is recommended not to perform any lower turbinal procedure associated with first intention (AE).

ÿ In the event of a suspected mucous or mixed origin, the etiology, in particular allergic, must be sought with the appropriate means (diagnosis of rhinitis, diagnosis of allergy). It is recommended to always start with medical management adapted to the etiology and to wait at least three months before evaluating its effectiveness (AE).

ÿ If there is a remarkable discrepancy between the intensity of the obstruction felt by the patient and the results of the assessment, in particular of the instrumental tests, it is recommended to seek a psychiatric opinion to look for a possible functional somatic disorder before any new decision surgery (EA).

ÿ Diagnosis of VNS is based on history taking (looking for a history of turbinal motion, paradoxical nasal obstruction and other nasal and extranasal symptoms classically associated in this entity), as well as physical examination. clinical and endoscopic
nose.

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- ÿ The improvement in the symptomatology felt by the patient with the wet cotton test (artificial limitation of the nasal air passage by a partially obstructing vestibular cotton wool placed in different sites) is an additional argument in favor of the diagnosis of VNS.
  It is recommended to carry out the wet cotton test (grade C).

- ÿ In all cases, before any turbinal procedure, the patient must be formally informed of the risk of occurrence of VNS.

- ÿ It is recommended to favor the techniques with the least risk of occurrence of con VNS serving at least 2/3 of the turbine structure (AE).

- ÿ It is recommended to always start the management of NSV with a medical treatment.
  cal (AE).

- ÿ When prolonged medical treatment (> 6 months) is insufficient to correct the symptoms and reduce the impact of VNS on the patient's quality of life, surgical treatment aimed at restoring resistance to the passage of air and improving the nasal airflow can be discussed (AE).

- ÿ In all cases, given the frequency of anxiety-depressive disorders and their links with the intensity of VNS symptoms, multidisciplinary care including psychiatric care is recommended (AE).

- ÿ It seems important to propose the establishment of a national register of the SNV allowing the collection of data as exhaustive as possible for real-life analysis.

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Preamble

This good practice recommendation fits into the care pathway for patients with chronic nasal obstruction or who have developed VNS after a turbinal procedure. It is part of a multidisciplinary consultation (associating ENT, general practitioner and any other necessary professional: psychiatrist, pulmonologist, speech therapist, physiotherapist, etc.) and a decision shared with the duly informed patient.

Referral

The Empty Nose Syndrome France Association sent a referral to the HAS relating to the syndrome of the same name, relayed by the French Federation of Associations and Friends of the Sick, Insufficient or Respiratory Disabled (FFAAIR).

Among the numerous requests made in this referral, which do not all fall within the scope of HAS missions, is the "scientific evaluation of the indications for the technique of ablation and/or reduction of the turbinates, of the determinants of the empty nose syndrome and currently available treatments for SNV".

HAS included in its work program the development of a recommendation for good practice and invited the applicant and the National Professional Council for Otorhinolaryngology and Cer vico-facial Surgery in order to define the topic. These concerted stakeholders retained the title: "Prevention, diagnosis and management of empty nose syndrome in the event of surgery for nasal obstruction". The working group subsequently wished to modify the title, which then became "Prevention, diagnosis and management of empty nose syndrome".

Context

Empty nose syndrome (VSS) is a complication of turbinate reduction surgery performed as a last resort in cases of nasal obstruction, allergic rhinitis, etc. It is in practice a procession of nasal and extranasal symptoms (and not a disease) occurring within a variable period (days to years) after turbinal surgery.

In the absence of a reliable epidemiological study, the incidence is poorly known.

On the physiopathological level, the VNS results in sensations of paradoxical nasal obstruction, loss of humidification functions and heating of the inspired air; loss of sensory receptors but retained menthol sensitivity; increase and modification of airflow speed; disturbances in ventilatory control; neuropsychic factors.

The SNV also results in extranasal signs: dyspnoea/hyperventilation; headaches; fatigue/difficulty concentrating; sleeping troubles ; anxiety/mood disorders.

The SNV can have psychological repercussions: depression, major desocialization, agora phobia, job loss and sometimes even damage to physical integrity.

Questions come up regularly and remain unanswered:

- ÿ Why do some patients who have undergone total ablation of the inferior turbinates for a patho tumor logy not develop VNS?
- ÿ Could simple cauterization of the inferior turbinates (the least invasive procedure possible) cause VS in some patients?

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- Why has SNV been described for 15-20 years while turbinate surgery is much more Ancient ?

There is a deficit of knowledge and recognition on the subject, and the impact on the quality of life of the patients concerned is major, but advances exist (study on dyspnea invoking hyperventilation, work on the flow of fluids by a team from Marseille, etc.).

In any case, the emphasis should be on informing the patient.

Goals

This recommendation for good practice aims on the one hand to prevent VNS, and on the other hand to diagnose and manage patients who develop VNS.

The purpose is to improve the care of patients and therefore the quality and safety of the care provided to them, as well as their quality of life, by helping decision-making in the choice of care and by allowing the professionals concerned improve and harmonize their practices.

Targets concerned

This good practice guideline concerns patients to whom surgery on the turbinates is proposed, as well as those who have developed VS after having undergone such surgery.

This recommendation of good practice is intended for professionals performing such surgical interventions likely to be the cause of VNS and more broadly for all those involved in the prevention, diagnosis, follow-up and management of patients. affected by NSV.

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1. General

1.1. Definition

There is no consensus definition of SNV. Nevertheless, it should be identified and for this the working group proposes the following definition.

The NSV is an iatrogenic condition which is characterized by the appearance of a procession of nasal symptoms, associated with extranasal repercussions, occurring more or less shortly after a gesture of reduction mainly of the inferior turbinates, but also middle, carried out in isolation. or associated with other procedures on the nasosinusian structures (nasal septum, sinuses, pyramid and nasal valve) (AE).

It should be differentiated from atrophic rhinitis which may present the same nasal symptoms but which occurs outside of any context of turbinate reduction or endona sal (AE) surgery.

1.2. Impact

The incidence of SNV after intervention on the turbinates remains largely unknown. There is no epidemiological study to rely on.

1.3. Time to onset

It is not possible, within the limits of current knowledge, to define an interval of occurrence between the performance of a gesture on the turbinates and the appearance of a VNS.

Nevertheless, taking into account the healing times of the nasal tissues, taking into account the physiopathological mechanisms considered below, it is reasonable to estimate that an SNV has no reason (except new nasal gesture or remarkable change of environment) to settle beyond two years after a turbinal gesture (AE).

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2. Pathophysiology

2.1. Pathophysiological mechanisms of the VNS: hypotheses

The pathophysiological mechanisms of SNV are complex and probably multiple. They are not yet clearly elucidated.

The turbinates, above all the inferior turbinates, have a major role in the nasal respiratory functions, heating and humidification of inspired air, barrier against airborne contaminants.
They are also involved in the control of breathing and in the feeling of nasal breathing comfort.

The nitric oxide (NO) secreted in the sinuses is conveyed, via nasal breathing, to the level of the lungs and allows an adaptation of the vascularization in order to optimize the gaseous exchanges. It could also have an antiviral and antibacterial action.

Pathologies affecting the turbinates, above all lower, can alter these different functions and be responsible in particular for nasal obstruction.

Instrumental gestures and surgical gestures on the turbinates, above all lower, used to respond to a problem of chronic nasal obstruction, can also lead to alterations in the functions of the turbinates contributing to the development of a VNS and explaining in particular its symptom. the most common, paradoxical nasal obstruction.

The paradoxical qualification is due to the fact that a turbinal reduction was performed to correct an obstruction, and while this reduction enlarges the diameter of the nasal passage for the passage of the air flow, the patient feels an obstruction which would mechanically no longer take place. be or to a lesser extent.

Data which deserve to be confirmed suggest that anatomo-functional links exist between the nerve centers and the receptors of the nasal mucosa. The coexistence of hyperventilation with the VNS and the symptomatic improvement with rehabilitation go in this direction.

2.2. Etiologies of VNS

By definition, the occurrence of a VNS is always the consequence of a lower or middle turbinal gesture. It is reasonable to link the SNV above all: ÿ to the

gestures on the inferior turbinates; ÿ and

the extent of turbine reduction (grade C).

When they are intended to correct a functional obstructive disorder, it is recommended to proscribe wide inferior turbinectomies which are the most at risk of occurrence of a VNS. In this indication, it is recommended to preserve at least 2/3 of the turbinal structure (AE).

2.3. Contributing factors

Apart from the triggering surgical factor, there is no favoring factor identified to date in the literature.

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3. Prevention

Preventive actions are essential in order to minimize the risk of occurrence of VNS.

In the face of chronic nasal obstruction, it is recommended to perform a nasal endoscopy, if necessary supplemented by a computed tomography, in search of an inflammatory, tumoral, pseudo-tumoral or infectious cause that would require specific management (AE).

It is then recommended to search for the architectural, mucosal or mixed origin of the chronic nasal obstruction based on:

- ÿ the characteristics of the obstruction;
- ÿ and the findings of the clinical examination (possibly supplemented by a clinical test at local vasoconstrictors in the absence of contraindication) (AE).

The results of an instrumental nasal exploration (rhinomanometry which studies the air flow pressure/ flow rate relationship and/or acoustic rhinometry which studies the internal geometry of the nasal fossae) with provocation tests with vasoconstrictors (in the absence of counter- indication) can be very useful for the characterization of chronic nasal obstruction and for therapeutic decision (EA).

In the event of performing a septoplasty or rhino-septoplasty intended to correct a chronic nasal obstruction of purely architectural origin, it is recommended not to perform any lower turbinal procedure associated with first intention (AE).

In case of suspected mucosal or mixed origin, the etiology, in particular allergic, must be sought with the appropriate means (diagnosis of rhinitis, diagnosis of allergy). It is recommended to always start with medical care adapted to the etiology and to wait at least three months before evaluating its effectiveness (AE).

In the event of symptomatic failure of the medical treatment, after verification of compliance with the treatment and a new clinical examination, if there is a remarkable discrepancy between the intensity of the obstruction felt by the patient and the examination clinically, it is recommended to perform a CT scan and an instrumental nasal exploration (rhinomanometry and/or acoustic rhinometry) with vasoconstrictor provocation tests (in the absence of contraindications) if they have not been performed beforehand (AE).

If nasal instrumental exploration (rhinomanometry and/or acoustic rhinometry) with vasoconstrictor provocation tests (in the absence of contraindications) confirms this discrepancy, it is recommended to look for a possible functional somatic disorder before any surgical decision (AE).

If there is no remarkable discrepancy between the intensity of the obstruction felt by the patient and the clinical examination, a turbinal reduction procedure can be proposed. It is recommended to favor the techniques with the least risk of occurrence of VNS, preserving at least 2/3 of the turbinal structure (AE).

In the event of symptomatic failure of this turbinal procedure, it is recommended to carry out a new clinical assessment, including imaging and instrumental tests (rhinomanometry and/or acoustic rhinometry) with provocation tests with vasoconstrictors (in the absence of counter- indication) before any decision for more invasive turbinate surgery (EA).

If there is a remarkable discrepancy between the intensity of the obstruction felt by the patient and the results of the assessment, in particular of the instrumental tests, it is recommended to seek an opinion.

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psychiatrist to look for a possible functional somatic disorder before any new surgical decision (AE).

In all cases, before any turbinal procedure, the patient must be formally informed of the risk of occurrence of VNS.

In addition to information on the risk associated with the intervention, and distinctly from this information, a decision aid can be useful to allow patients to orient themselves, if necessary, towards an intervention. HAS has also published elements to enable stakeholders to develop such aids for shared decision-making between patient and healthcare professional1 .

1 High Authority for Health. Elements for developing support for shared decision-making between patient and healthcare professional. Saint-Denis La Plaine: HAS; 2018.

https://www.has-sante.fr/jcms/c_2838959/fr/elements-pour-elaborer-une-aide-a-la-prise-de-decision-partagee-entre-patient-et-professionnel -health

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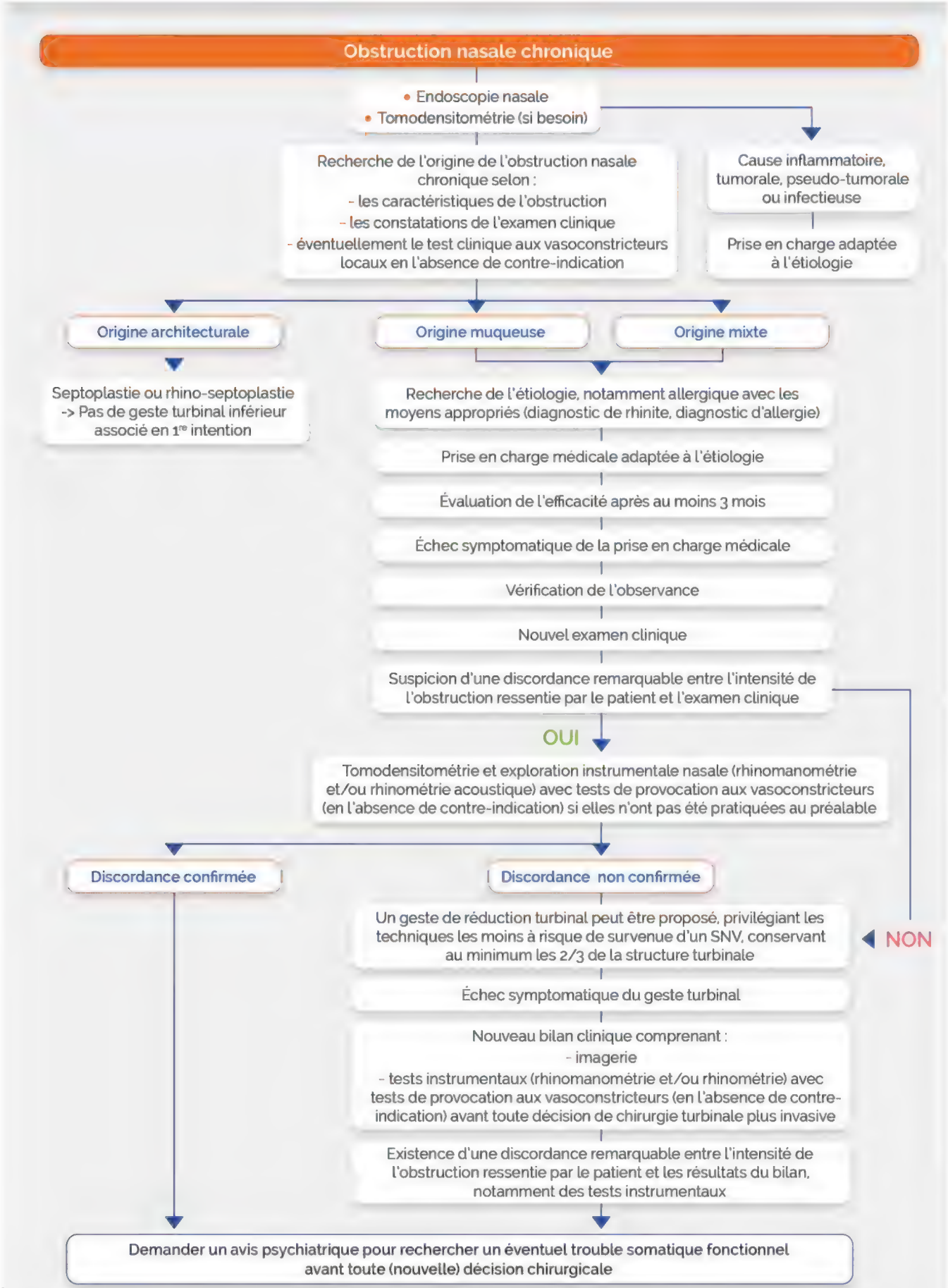
Figure 1. Arbre décisionnel
Prévenir la survenue du syndrome du nez vide


Obstruction nasale chronique
• Endoscopie nasale
• Tomodensitométrie (si besoin)
Recherche de l'origine de l'obstruction nasale chronique selon :
- les caractéristiques de l'obstruction
- les constatations de l'examen clinique
- éventuellement le test clinique aux vasoconstricteurs locaux en l'absence de contre-indication
Cause inflammatoire, tumorale, pseudo-tumorale ou infectieuse
Prise en charge adaptée à l'étiologie
Origine architecturale
Origine muqueuse
Origine mixte
Septoplastie ou rhino-septoplastie -> Pas de geste turbinal inférieur associé en 1re intention
Recherche de l'étiologie, notamment allergique avec les moyens appropriés (diagnostic de rhinite, diagnostic d'allergie)
Prise en charge médicale adaptée à l'étiologie
Évaluation de l'efficacité après au moins 3 mois
Échec symptomatique de la prise en charge médicale
Vérification de l'observance
Nouvel examen clinique
Suspicion d'une discordance remarquable entre l'intensité de l'obstruction ressentie par le patient et l'examen clinique
OUI
NON
Tomodensitométrie et exploration instrumentale nasale (rhinomanométrie et/ou rhinométrie acoustique) avec tests de provocation aux vasoconstricteurs (en l'absence de contre-indication) si elles n'ont pas été pratiquées au préalable
Discordance confirmée
Discordance non confirmée
Un geste de réduction turbinal peut être proposé, privilégiant les techniques les moins à risque de survenue d'un SNV, conservant au minimum les 2/3 de la structure turbinale
Échec symptomatique du geste turbinal
Nouveau bilan clinique comprenant :
- imagerie
- tests instrumentaux (rhinomanométrie et/ou rhinométrie) avec tests de provocation aux vasoconstricteurs (en l'absence de contre-indication) avant toute décision de chirurgie turbinale plus invasive
Existence d'une discordance remarquable entre l'intensité de l'obstruction ressentie par le patient et les résultats du bilan, notamment des tests instrumentaux
Demander un avis psychiatrique pour rechercher un éventuel trouble somatique fonctionnel avant toute (nouvelle) décision chirurgicale

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4. Diagnosis

The diagnosis of VNS is based on an interrogation in search of a history of turbinal gesture, paradoxical nasal obstruction and other nasal symptoms (dryness, crusts, hypersensitivity to various stimuli, pain, posterior rhinorrhea, disorder of smell) and extranasal (dysp nee, sleep disorders, attention disorders, anxiety disorders, depressive disorders, headaches, pharyngeal dryness) classically associated in this entity.

The clinical and endoscopic examination of the nose is essential, it must endeavor to evaluate the turbinal volume and the possibly persistent vasoreactivity, and to seek other mucosal and architectural abnormalities.

The improvement of the symptomatology felt by the patient with the wet cotton test (artificial limitation of the nasal air passage by a partially obstructive moistened cotton wool placed in different sites) is a complementary argument in favor of the diagnosis of VNS. It is recommended to carry out the wet cotton test (grade C).

Imaging is recommended allowing the appreciation of the residual turbinal volume on a shareable document and possibly allowing the comparison with pre-existing imaging to the turbinal gesture if it exists (AE).

Rhinomanometry, more than acoustic rhinometry, is recommended to objectively rule out potential persistent nasal obstruction (AE).

In all cases, it is recommended to evaluate the impact of the symptoms on the patient's quality of life (possibly by self-questionnaire SNOT-22) and to assess their impact in terms of family, social and professional life (AE) .

In the event of suspicion of an anxio-depressive syndrome and/or remarkable discrepancy between the symptoms, the findings of the assessment and the impact on the patient's quality of life which may suggest a functional somatic disorder, it is recommended to address the patient for a psychiatric opinion (AE).

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5. Support

The management of SNV is not yet consensual in the literature. Nevertheless, it is recommended:

- ÿ to establish the diagnosis with the appropriate means, its recognition being an important step load-bearing for patient care (AE);
- ÿ to look for a hyperventilation syndrome (dyspnoea and ventilatory changes unrelated to a haematosis disorder or an organic anomaly of ventilatory regulation) and to propose rehabilitation depending on the results of the respiratory tests (grade C);
- ÿ to always start with medical treatment (AE); ÿ to look for
- a possible functional somatic disorder and/or an anxio-depressive syndrome partner for specialized care (AE).

For medical treatment, depending on the patient's tolerance and perceived efficacy, it is recommended to combine nasal cavity washes (saline serum, sulfur derivatives) with nasal humidification means (moisturizing gel and ointment, humidifying aerosol) while limiting the frequency of their use to prevent the risk of reinforcing mechanisms and paradoxical aggravation of the disorders. In the event of local signs of infection, the use of antibiotics (oral, local) is possible in the absence of contraindications. In case of local signs of inflammation, the use of local corticosteroids is possible in the absence of contraindication (AE).

The use of menthol inhalation, which can provide a feeling of respiratory and nasal comfort, is also recommended if it is well tolerated (grade C).

When prolonged medical treatment (> 6 months) is insufficient to correct symptoms and reduce the impact of VS on the patient's quality of life, surgical treatment aimed at restoring resistance to air passage and improving the nasal airflow can be discussed. It is recommended to feed this discussion by (AE):

- ÿ a complete assessment (clinical examination, computed tomography, instrumental tests, cotton hu test mid);
- ÿ a psychiatric assessment.

In the absence of studies with a high level of evidence, one technique cannot be recommended more than another, nor one filler material more than another (AE).

If surgical treatment is envisaged, it is necessary to clearly inform the patient about the technique and the material used, the perioperative constraints inherent in anesthesia and surgery, as well as the non-negligible risk of failure and hardly predictable.

In all cases, given the frequency of anxiety-depressive disorders and their links with the intensity of VNS symptoms, multidisciplinary care including psychiatric care is recommended (AE).

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6. Outlook

6.1. Progress in diagnosis, epidemiology and management charge

As underlined on several occasions, information is lacking in a number of fields concerning the VNS, both on its epidemiological aspects, its post-intervention onset times, the type of gestures triggering the VNS, the frequency of the various symptoms, the social impact family/professional and psychiatric, the explorations carried out and the treatments implemented and their effectiveness.

Validation of the French translation of the ENS6Q score would provide a more specific tool for assessing the quality of life of patients with VNS.

It seems important to propose the establishment of a national register of the SNV allowing the most exhaustive possible collection of these data for a real-life analysis of the practice of the various caregivers brought to take care of patients with SNV.

6.2. Exploring Sleep Disorders During VNS

Sleep disturbances are almost constant in the SNV, but they have not been characterized.
Their origin is certainly multifactorial: nasal dysfunction (difficulty falling asleep and nocturnal awakenings), ventilatory disorders (sleep apnea, high resistance syndrome of the upper airways), anxiety and depressive disorders. It seems important to propose a prospective study of the sleep of these patients at best using polysomnography, specific validated questionnaires and a sleep diary, which will make it possible to better characterize these sleep disorders and their different components, to provide appropriate support.

6.3. Developing comprehensive care approaches

It emerges from the analysis of the literature and the experience of the caregivers involved in this recommendation of good practice that the VNS is accompanied more or less frequently by diurnal (and perhaps nocturnal) ventilatory disorders. The post-surgical decrease in nasal resistance and disturbances in the collection of signals normally picked up at the level of the nasal mucosa (increase in airflow speeds, decrease in sensory sensors of the nasal mucosa, lack of humidification and thermoregulation of the airflow, decreased nasal NO production) are most likely involved in ventilation control dysfunctions (the frequent association of VNS with a hyperventilation syndrome would be a good example).

It would be interesting to explore these ventilatory disorders further and, at the same time, to develop methods:

- speech therapy rehabilitation and/or oro-myo-facial physiotherapy by analogy with what exists in “mouth-breathing” patients;
- specific respiratory rehabilitation perhaps inspired by methods developed in the hyperventilation syndrome.

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It would also be interesting to explore the mechanisms of pain when it is present in these patients (algologist, neurologist, pain center and multidisciplinary management).

In all cases, complementary therapy approaches could be useful but remain to be evaluated (sophrology, osteopathy, acupuncture, etc.).

6.4. Develop minimally invasive methods to decrease the flow air

In the vast majority of cases, it is the excessive resection of part of the turbinates that involves the development of the SNV. The excess passage of the air flow at the nasal level with reduced turbulence and acceleration of speeds makes it possible to explain the development of nasal symptoms (paradoxical obstruction, dryness, pain in particular with cold air, posterior rhinorrhea, etc.) and is probably involved in certain extra-ENT disorders (dyspnea, hyperventilation, etc.).

Moreover, many authors propose the performance of a wet cotton test aimed at partially obstructing the nasal cavities by seeking the symptomatic improvement perceived subjectively by the patient.

Some teams are working, using digital simulation of fluid flow, on a personalized approach aimed at virtually recreating the exact possible obstacle to airflow in order to then be able to propose it surgically. These still experimental approaches will not be able to enter clinical routine for several years.

It seems important to develop minimally invasive approaches aimed at limiting nasal airflow.
The development of potentially humidifying nasal vestibular filters by industrialists seems interesting even if their permanent wearing is unlikely. Intranasal injection into well-selected anatomical sites of resorbable compounds (eg hyaluronic acid, autologous fat) could improve symptoms and quality of life but needs to be evaluated. The possible improvement thus obtained in a patient could also be predictive of a good result of a surgical implantation of non-absorbable materials. Finally, in the future, the development of tissue reengineering techniques may make it possible to approach turbinal "reconstruction".

6.5. Dedramatize and democratize the psychiatric part of the decision in charge

The impact of VS in family, social and professional life is often major and goes beyond the simple framework of symptoms and associated disorders. Patients with VNS more easily develop an anxiety-depressive disorder and/or a functional somatic disorder which play a major role in this impact. Organ specialists, above all ENT specialists, caring for patients are often powerless (due to a lack of skills) to diagnose these disorders and help patients overcome them. It seems essential that patients with VNS be able to consult a psychiatrist who will be able to establish the correct diagnosis and guide treatment. This is not about "psychiatrizing" the VNS, as feared by some patients.

For greater efficiency, exchanges of information and training actions seem important.
It seems necessary for organ specialists to learn to master some clinical screening keys for anxiety-depressive disorders and functional somatic disorders and thus be able to offer

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patients a consultation with a psychiatrist. Conversely, it is also important that psychiatrists receive more information about VS and its clinical particularities.

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Attendees

The following professional organizations and patient and user associations have been asked to propose experts invited on an individual basis to the working/reading groups:

Association empty nose syndrome France*

College of General Medicine

French College of Speech Therapy*

National college for the quality of care in psychiatry

National Professional Board of Internists

National Professional Board of Neurology

National Professional Board of Otorhinolaryngology and Cervicofacial Surgery*

National Professional Council of Pneumology*

National Professional Board of Psychiatry

French Federation of Psychiatry*

French Federation of Associations and Friends of the Sick, Insufficient or Respiratory Handicapped*

French Federation of Psychologists and Psychology*

French Language Clinical Neurophysiology Society

Physiological Society

French society for the study and treatment of pain

French Society for Sleep Medicine and Research

(*) This organization proposed one or more experts for this project.

Work group

Pr André Coste, otolaryngologist and cervico-facial surgeon, Créteil – chairman of the working group

Dr Julie Fernandez Rodriguez, otolaryngologist and cervico-facial surgeon, Marseille – project manager

Mr. Cédric Paindavoine, Saint-Denis – HAS project manager

Mr. Gilles Chatevaire, user of the health system

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Dr Sandrine Launois, pulmonologist, Neuilly

Mr. Didier Lerond, speech therapist, Woippy

Pr Geoffrey Mortuaire, otolaryngologist and cervico-facial surgeon, Lille

Mr. Ludovic Palot, user of the health system

Dr Michel Petitjean, physiologist and respiratory physician, Clamart

Dr Laurent Portel, pulmonologist, Libourne

Dr Nathalie Raymond, pulmonologist, Bordeaux

Dr Léa Rotenberg, psychiatrist, Paris

Reading group

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Mrs. Christine Attia, user of the health system

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Pr Laurent Castillo, otolaryngologist and cer vico-facial surgeon, Nice

Mr. Harold Chaney, health system user

Dr Alain Corré, otolaryngologist and head and neck surgeon, Paris

Pr Louis Crampette, otolaryngologist and cer vico-facial surgeon, Montpellier

Mr. Jérôme Davoine, user of the health system

Dr Céline Desvant-Mouawad, otolaryngologist and head and neck surgeon, allergist, Lille

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Mr. Denis Flahaut, health system user

Mrs. Anne-Marie Froment, user of the health system

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Dr Jean-Baptiste Fron, general practitioner, Châtillon

Dr Stéphanie Fry, pulmonologist, Lille

Mr. David Gérard, health system user

Mr. Nicolas Guez du Chaffaut, user of the health system

Mrs. Françoise Hoareau, user of the health system

Dr Dany Jaffuel, pulmonologist, Montpellier

Mr. Antoni Janusz, user of the health system

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Dr Vincent Patron, otolaryngologist and cer vico-facial surgeon, Caen

Dr Christophe Perrin, pulmonologist, Monaco

Mr. Kuider Rafai, health system user

Mrs. Nathalie Renaudin, user of the health system

Pr Cécile Rumeau, otolaryngologist and cer vico-facial surgeon, Nancy

Pr Élie Serrano, otolaryngologist and head and neck surgeon, Toulouse

Dr Hervé Solatges, general practitioner, Nîmes

Dr Christophe Sureau, general practitioner, Cartelègue

Mrs. Diana Thabet, user of the health system

Mrs. Catherine Thibault, psychologist, speech therapist, Cla mart

Dr Thibault Vanderhaegen, otolaryngologist and head and neck surgeon, Lille

Thanks

HAS would like to thank all the participants mentioned above.

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Abbreviations and acronyms

ENS6Q	*Empty Nose Syndrome 6-item Questionnaire*
HAS	High Authority of Health
NO	Nitric oxide
ENT	Otolaryngology/otolaryngologist
SNOT-22	*Sino-Nasal Outcome Test-22*
SNV	Empty nose syndrome

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